REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORK PLAN CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE OPERABLE UNIT NO. 3 (OU-3) GROUNDWATER

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SECTION 1

INTRODUCTION

This Remedial Investigation/Feasibility Study (RI/FS) Work Plan addresses the assessment of groundwater contamination and associated soil vapor at the Cornell-Dubilier Electronics (CDE) Superfund Site (the Site) in South Plainfield, New Jersey. The Work Plan has been prepared in accordance with the Administrative Settlement Agreement and Order on Consent (Settlement Agreement) entered into between the US Environmental Protection Agency (USEPA) and Dana Corporation (Dana) with an effective date of August 6, 2005.

In accordance with the provisions of the Settlement Agreement, the objectives of this Work Plan are to:

- Through the implementation of an RI, characterize the nature and extent of groundwater contamination and associated soil vapor, and assess the potential for impacts to human health, welfare or the environment;

- Through an FS, evaluate alternatives for remedial action for groundwater and associated soil vapor, based on the characterization and assessment of impacts performed for the RI.

In addition, to the extent appropriate and necessary, the work will be coordinated with the ongoing activities being performed by others for other operable units.

Section 2.0 of the Work Plan presents a discussion of Site background and physical setting including location, geology, hydrogeology and Site history. Section 3.0 presents a summary of the conceptual site model, which forms a basis for the overall, current understanding of Site characteristics. Section 4.0 presents the specific Scope of Work and is structured consistent with the tasks called for in the Settlement Agreement. For each task in Section 4.0, a subsection is devoted to describe the purpose of the task, the approach or technical rationale for how the work will be completed, and a description of the work or deliverable(s) associated with the task. Section 5.0 then presents a schedule for completion of the work described in this Work Plan, followed by a description of the project organizational structure in Section 6.0. Supporting documents presented as attachments to this work plan include a Field Sampling Plan/Quality Assurance Project Plan (Attachment A) and Health and Safety Plan (Attachment B).

SECTION 2

BACKGROUND AND PHYSICAL SETTING

The following sections provide an overview of the physical setting of the Site, including geology and hydrogeology, as well as a description of the Site history and current site activities. Additional details can be found in the document entitled "Preliminary Conceptual Site Model, Cornell-Dubilier Electronics Superfund Site", September 20, 2005, revised February 2006, provided as Attachment C to this Work Plan.

2.1 SITE LOCATION

The Cornell-Dubilier Electronics (CDE) Superfund Site is located at 333 Hamilton Boulevard, Borough of South Plainfield, Middlesex County, New Jersey (Figure 2-1). The former CDE facility, now known as the Hamilton Industrial Park, consists of a fenced, 26-acre parcel of land that is bounded on the northeast by the Bound Brook and the former Lehigh Valley Railroad, Perth Amboy Branch (presently Conrail); on the southeast by the Bound Brook and a property used by the South Plainfield Department of Public Works; on the southwest, across Spicer Avenue, by single family residential properties; and to the northwest, across Hamilton Boulevard, by mixed residential and commercial properties.

The surrounding area represents an urban environment with principally commercial and light industrial use to the northeast and east, principally residential development to the south and directly north, and mixed residential and commercial properties to the west.

2.2 PHYSICAL SITE CHARACTERISTICS

The Site can best be described as two separate areas. The northwest, or developed area of the Site, is characterized by buildings and roadways, and comprises approximately 40 percent of the land area. Approximately 18 structures are located in this area, often subdivided into separate units that are leased to various tenants. In general, open areas on this portion of the Site have been paved as part of prior removal actions, with only small, fenced-in areas of vegetation remaining. A system of catch basins is present throughout this area that channels stormwater flow to two outfalls along the Bound Brook. Investigations have indicated that some of the building interior floor drains also discharged to these catch basins.

The southeast, or undeveloped area of the Site, is predominately vegetated with a fenced semi-paved area in the middle. The Bound Brook flows from the eastern corner across the northeastern border of this area. Comprising approximately 60 percent of the land area, the undeveloped portion is separated from the developed portion by a chain-link fence with locked gates. The central area of this portion is relatively flat and is primarily an open field, with some wooded areas to the northeast and south and the semi-paved area in the middle. Beyond this area, the topography drops steeply to the northeast and southeast, and consists primarily of wetland areas bordering the Bound Brook. Elevations range from approximately 71 feet above msl at the top of the bank to approximately 60 feet above msl along the Bound Brook.

Wetlands were previously mapped on the Site (June 20 and 21, 2000), and the mapping was presented in the Remedial Investigation Report for Operable Unit 2 (Foster Wheeler, December 2002). The wetlands are generally limited to smaller, isolated areas within the undeveloped portion of the Site, with the larger of the wetlands areas adjacent to the Bound Brook. The wetlands are discussed further in Section 4, in relation to the proposed well locations.

2.3 GEOLOGY AND HYDROGEOLOGY

The Site lies within the Piedmont Physiographic Province and is underlain by a relatively thin layer of soils comprised of quarternary glacial deposits and artificial fill. These unconsolidated deposits overlie the late Triassic to early Jurassic Age Passaic Formation (formerly Brunswick Formation) of the Newark Group.

The overburden soils range in thickness from 0.5 to 15 feet and generally thicken towards the Bound Brook. The natural soils represent a mix of red-brown silt and sand as well as silt and clay layers, with a generally consistent weathered siltstone unit immediately above bedrock that consists predominantly of red-brown silt to fine sand, with sub-rounded to angular, fine to coarse siltstone gravel and silty clay. This weathered zone interfingers with urban fill material at a number of locations on the Site. The fill material generally consists predominately of cinders, ash, brick, glass, metal, slag, and wood fragments.

The top of the consolidated Passaic Formation bedrock generally ranges from 4 to 15 feet below ground surface, except in the far northwest corner of the Site, where bedrock is found immediately underlying the building slabs. The surface of the bedrock generally slopes to the south-southeast and consists of red-brown to purplish-red mudstone and siltstone with localized beds of fine-grained sandstone. These sedimentary units generally strike to the northeast and dip between 5 and 15 degrees to the northwest, with primary fracture patterns both parallel and perpendicular to bedding (Lewis-Brown and dePaul, 2000). Rock cores collected on-site were noted to contain heavily fractured zones, generally occurring along bedding planes.

The thin unconsolidated materials overlying bedrock exhibit discontinuous zones of perched water that do not constitute an aquifer at the Site. These discontinuous zones of perched water occur frequently where unconsolidated natural and fill materials of variable composition interfinger. The depths of the perched zones are variable across the Site, although they typically occur in the range of 4 to 8 feet below ground surface. In comparison, the potentiometric surface of the shallow bedrock, the regional water table, typically ranges from 11 to 20 feet below ground surface. The layers of silt, clay, and weathered siltstone, comprising the overburden/top of bedrock zone, provide the relative resistance to vertical flow that allows these perched zones to occur during sufficiently wet periods.

The underlying Passaic Formation represents a multi-unit leaky aquifer system that consists of interbedded siltstone, mudstone and shale. Groundwater flow within the Passaic Formation is primarily through secondary permeability associated with interconnected fractures. By comparison to this secondary permeability, the unit, as a result of compaction and cementation, has limited porosity and permeability. The upper 50 to 60 feet of the Passaic, however, is typically weathered such that the fractures are generally filled with low permeability silt and clay that limits the hydraulic conductivity of this zone. This upper weathered zone represents the upper most contiguous water-bearing zone beneath the Site. Below this zone, the Passaic is typically semi-confined and can yield significant quantities of water. Groundwater flow is controlled by the degree of fracturing and the anisotropy of the formation, which results from the typically higher values of hydraulic conductivity along the direction of strike (generally to the northeast). The magnitude of this anisotropy can play a significant role in controlling groundwater flow direction.

Mapping of the potentiometric surface within the upper weathered zone beneath the Site suggests groundwater flow to the northwest. In addition, data collected to date from stream gauge measurements in the Bound Brook indicate higher head levels than those in nearby bedrock wells. These data suggest that the Bound Brook in the area of the Site is recharging the upper bedrock aquifer and does not represent a groundwater discharge point. This is likely due to the large number of municipal water supply wells located north of the Site along a broad swath of the aquifer located south of the Watchung Ridge, that may influence groundwater levels and direction of groundwater flow in the Site vicinity. Nevertheless, verifying the inter-relationship of groundwater and surface water is a component of the tasks enumerated in Section 4 of this Work Plan.

2.4 SITE CONSTITUENTS (CONTAMINANTS OF CONCERN)

Previous Site investigations indicate elevated concentrations of VOCs, SVOCs, pesticides, PCBs, and metals in the on-Site soils and sediments. Groundwater analytical results indicate elevated levels of VOCs, PCBs, and pesticides, with PCBs present likely as a result of cosolvency effects due to high VOC concentrations as well as suspended solids. Soils containing elevated levels of VOCs, PCBs, and pesticides, thus appear to represent a source to groundwater. On the other hand, metals found at elevated levels in the soils were not found in the groundwater. Therefore, soils impacted by metals do not appear to be a source to groundwater. Finally, although several SVOCs and pesticides were detected sporadically in groundwater, SVOCs and pesticides detected in soils do not appear to be a significant source to groundwater.

Trichloroethene (TCE) and its degradation product cis-1,2-dichloroethene (Cis-1,2-DCE) represent the compounds most frequently detected and at the highest reported concentrations in the groundwater beneath the Site, followed by PCBs and the pesticide aldrin.

As previously noted, the work completed to date at the Site indicates that surface water elevations in the Bound Brook are above the potentiometric surface in nearby bedrock wells. These data indicate that groundwater does not locally discharge to the Bound Brook, although the inter-relationship of groundwater and surface water will be further investigated as a part of this Work Plan, as described in Section 4. If groundwater has not characteristically discharged locally to surface water, then impacts to sediments in the Brook may be unrelated to groundwater and may be related to surface water runoff and discharge from the Site's interconnected floor drains and stormwater catch basins that discharged to two locations along the Bound Brook. PCBs, VOCs, SVOCs, pesticides, and metals were detected in sediment and standing water samples collected from these catch basins. Previous Site stabilization measures (i.e., paving and silt fencing) that were implemented by the property owner in 1997 addressed the potential for Site contaminants to reach the Bound Brook via overland runoff and through the facility drainage system discharges.

On the basis of existing data, the contaminants of concern related to groundwater include primarily VOCs, but also pesticides and PCBs. Table 2-1 provides a summary of the Site constituents and range of concentrations detected in on-Site groundwater. Other contaminants not specifically identified in Table 2-1 were sporadically reported at various locations. However, the list in Table 2-1 represents those most commonly reported, with TCE routinely detected throughout the Site, followed by PCE (albeit less frequently). PCBs were also reported in bedrock groundwater in monitoring wells completed on the Site. PCBs have not been tested for during other studies performed outside the boundaries of the CDE property.

2.5 SITE HISTORY

The first recorded industrial use of the Site was by Spicer Manufacturing Corp., who owned and operated the facility from 1912 to 1929, after which it ceased operations in South Plainfield. Many of the buildings on the Site were constructed in 1918 to support Spicer's manufacture of various automobile industry parts such as universal joints, clutches, etc. Beginning in 1936, the property was leased to CDE, which manufactured electronic components from 1936 to 1962. In 1956, CDE purchased the property and owned it until

1962 when it was sold to D.S.C. of Newark Enterprises Inc. (DSC). Since DSC's purchase of the property, the former CDE facility, now known as the Hamilton Industrial Park, has been leased to an estimated 100 tenants and is currently being used by a variety of commercial and industrial tenants. In December 2001, the South Plainfield Borough Council designated the Hamilton Industrial Park and certain lands in the vicinity of the industrial park as a "Redevelopment Area". The Borough retained a planning consultant to prepare a redevelopment plan for the designated area and has designated a developer to implement the plan.

Environmental conditions at the Site were first investigated by NJDEP in 1986. Since that time, sampling conducted by NJDEP and USEPA showed the presence of elevated levels of PCB's, VOC's and inorganics in Site soils, sediments and surface water. In 1997, USEPA conducted a preliminary investigation of the Bound Brook and also collected surface soil and interior dust samples from nearby residential and commercial properties. These investigations lead to fish consumption advisories for the Bound Brook and its tributaries. As a result of these sampling activities, the Site was added to the NPL in July 1998. In addition, based on data collected on and off-site, USEPA ordered several removal actions to be performed, as follows:

- In March 1997, EPA ordered DSC, as the owner of the facility property and a potentially responsible party (PRP), to perform a removal action associated with contaminated soil and surface water runoff from the facility. The removal action included paving driveways and parking areas in the industrial park, installing a security fence, and implementing drainage controls.
- In 1998, USEPA initiated a removal action to address PCBs in interior dust at houses to the west and southwest of the Site.
- In 1998, EPA ordered DSC and CDE to implement a removal action to address PCBs in soils at six residential properties located to the west and southwest of the Site. This removal action was conducted by CDE from 1998 to 1999.
- In 1999, EPA entered into an AOC with CDE and Dana to implement a removal action to address PCBs in soils at 7 residential properties located to the west and southwest of the Site. This removal action was conducted from 1999 to 2000.
- In April 2000, EPA entered into an AOC with DSC requiring the removal of PCB-contaminated soil from one additional property located on Spicer Avenue. DSC agreed to perform the work required under the AOC, but subsequently did not do so. In August 2004, EPA began the removal of PCB-contaminated soil from this property, and the work was substantially completed in September 2004.

In 2000, Foster Wheeler, under contract to USEPA, implemented a remedial investigation (RI) that included the collection of on- and off-site soil and sediment samples, on-site building surface samples, and on-site groundwater samples. These data were compiled in the *Data Evaluation Report for Cornell-Dubilier Electronics Superfund Site, South Plainfield, Middlesex County, New Jersey* (Foster-Wheeler, 2001). Subsequent to initiating the RI, USEPA divided the Site into four operable units (OUs): OU-1 addresses impacted properties in the vicinity of the Site; OU-2 addresses impacted on-site soils and buildings; OU-3 addresses impacted groundwater; and OU-4 will address contaminated sediments within the Bound Brook. The RI and Feasibility Study (FS) for OU-1 were issued by USEPA in 2001. In June 2003, USEPA proposed a remedy for OU-1, and the Record of Decision (ROD) for OU-1 was issued on September 30, 2003. The selected remedy projects the removal of approximately 2,100 cubic yards of impacted soils from neighboring properties as well as indoor dust remediation where PCB contaminated dust is encountered. Additional sampling (soil and dust) is also planned to determine if further remediation is required.

The final RI Report for OU-2 was issued in December 2002. The FS for OU-2 was then issued in April 2004, and the ROD was issued in September 2004. The remedy specified in the ROD contemplates the excavation and on-site treatment and/or off-site disposal of an estimated 107,000 cubic yards of soils containing PCB concentrations greater than 500 ppm, or other contaminants containing concentrations above New Jersey's Impact to Groundwater Soil Cleanup Criteria (IGWSCC), plus an additional estimated volume of 7,500 cubic yards of contaminated soil and debris from the capacitor disposal area. Following excavation, the Site will be regraded and capped. Demolition of the 18 on-Site buildings will also be completed with appropriate off-Site disposal of the debris.

The performance of the remedial actions identified for OU-1 and OU-2 is currently pending.

2.6 PUBLIC/RESIDENTIAL WELL SEARCH

An NJDEP well record search for wells located within a 1.5-mile radius of the Site was completed in October 2005. Information was obtained from a New Jersey Department of Environmental Protection (NJDEP), Bureau of Water Allocation record search covering both existing and previously abandoned public water supply and other types of wells (e.g., private water supply, monitoring). In addition, the Middlesex County Public Health Department, the Middlesex County Engineering Department, the Borough of South Plainfield Public Works Department, and the Plainfield Public Works Department were contacted. None of these departments keep records on wells.

Figure 2-2 illustrates well locations within a 1.5-mile radius of the Site. Well permit numbers, date of completion, location, owner's name, depth, and capacity are summarized on Table 2-2. The wells illustrated in Figure 2-2 were identified through the NJDEP well records search referenced above, and the current status of some of these wells (i.e., active or inactive) is currently unclear. Additional information regarding these wells is currently being sought.

The well records search identified the Middlesex Water Company as a main water supplier for the South Plainfield area. The Middlesex Water Company's Quarterly Water Allocation Permit Reports were, therefore, obtained and well locations, permit numbers and water diversion information (e.g., pumping records) from 1936 to 2005 were collected. The Water Allocation Permit records are summarized on Table 2-3.

As illustrated in Table 2-3, the Middlesex Water Company's records indicate that pumping has been ongoing since 1953. This pumping, as discussed in more detail in the Preliminary Conceptual Site Model, can have a substantial impact on groundwater flow and contaminant migration. Therefore, these well records will continue to be evaluated as a part of the RI/FS Work Plan implementation.

As a part of the ongoing evaluation of well pumping data, several inconsistencies and gaps in the data, which may affect the ability to interpret groundwater flow conditions, have been identified. As a consequence, HydroQual, Inc., by letter dated December 21, 2005 (See Attachment D), contacted the Middlesex Water Company and requested assistance with reconciling the inconsistencies (e.g., correlation of names, well numbers, and permit numbers) and filling the gaps (e.g., well coordinates, record of abandoned group of wells in the 1960s). A response to this letter has not yet been received. Therefore, work is continuing in order to complete the collection of well records pertinent to the OU-3 RI/FS.

TABLE 2-1

SUMMARY OF CONSTITUENTS IN GROUNDWATER AT THE CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE

Compound	Minimum Detected Concentration (ppb)	Maximum Detected Concentration (ppb)	Frequency of Detection
Volatile Organics (VOCs)			
Trichloroethene (TCE)	17	120,000	12/12
Cis-1,2-Dichloroethylene	2	190,000	12/12
Tetrachloroethene (PCE)	12	520	3/12
Vinyl Chloride	9	160	3/12
1,2,4-Trichlorobenzene	1,200	1,200	1/12
Semi-Volatile Organics (SVOCs)			
Naphthalene	5	5	1/12
Bis(2-Ethylhexyl) phthalate	1	1	1/12
Pesticides and PCBs			
beta-BHC	.016	.016	1/12
delta-BHC	.074	.074	1/12
Aldrin	.022	1.3	9/12
PCB – Aroclor 1232	.53	80	9/12
PCB – Aroclor 1254	4.1	9.2	4/12

Note: Inorganics (metals) found at elevated concentrations in the soils were not elevated in groundwater. Inorganics were detected as naturally occurring elements.

TABLE 2-2
NJDEP INDUSTRIAL/MUNICIPAL WELL SEARCH
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
South Plainfield, New Jersey

No.	Permit No.	Owner	Well Location	Depth (ft)	Capacity (gpm)	Date Permit Issued (or well completed)
	PUBLIC SUPPLY					
PS1	2500190	MIDDLESEX WATER CO.	South Plainfield, N.J. (52 Main St., Woodbridge)	403	412	6/16/1948
PS2	2500421	MIDDLESEX WATER CO.	South Plainfield, N.J. (Well No. 2)	409	542	3/28/1949
PS3	2503969	MIDDLESEX WATER CO.	South Plainfield, N.J. (Deepening No. 1 well)	0	0	10/18/1954
PS4	2504775A	MIDDLESEX WATER CO.	Plainfield, N.J. (Park Ave. Pumping Station)	514	239	7/8/1955
PS5	2504776	MIDDLESEX WATER CO.	South Plainfield, N.J. (52 Main St., Woodbridge)	300	0	7/8/1955
PS6	2511815	MIDDLESEX WATER CO.	South Plainfield, N.J. (52 Main St., Woodbridge)	500	0	2/19/1964
PS7	2511816	MIDDLESEX WATER CO.	South Plainfield, N.J. (26 Park Ave.)	495	358	2/19/1964
PS8	2511822	MIDDLESEX WATER CO.	South Plainfield, N.J. (27 Park Ave.)	501	347	2/27/1964
PS9	2511823	MIDDLESEX WATER CO.	South Plainfield, N.J. (5 South Plainfield)	500	600	2/27/1964
PS10	2512119	MIDDLESEX WATER CO.	South Plainfield, N.J. (28 Park Ave.)	500	325	7/7/1964
PS11	2512120	MIDDLESEX WATER CO.	South Plainfield, N.J. (29 Park Ave.)	500	730	7/7/1964
PS12	2512131	MIDDLESEX WATER CO.	South Plainfield, N.J. (Well No. 32)	501	250	7/7/1964
PS13	2512461	MIDDLESEX WATER CO.	South Plainfield, N.J. (Well No. 31)	500	510	11/6/1964
PS14	2516311	ELIZABETHTOWN WATER	1341 North Ave., Plainfield, N.J. 07062	500	350	4/18/1972
	NON PUBLIC					
NP1	2550324	ATLAS OIL COMPANY	318 Durham Ave.	300	40	3/4/1997
	PUBLIC NON COMMUNITY					
PNC1	2515527	HARRIS STEEL	Piscataway, NJ	165	6	5/20/1970
PNC2	2521010	ROTHBERG, LOUIS N.	Ryan St., Piscataway, NJ	175	15	10/1/1979
	IRRIGATION					
I1	2512254	BOLAND, MAURICE J	1 Candler Rd., Metuchen, NJ	150	35	8/24/1964
I2	2523756	SO. PLAINFIELD COMMU	Maple Ave/ Park Ave; South Plainfield, NJ 0708	250	25	4/8/1983
I3	2557458	South Plainfield BD of ED	Lake Street; (well No. 3)	150	500	2/2/2001
I4	2557459	South Plainfield BD of ED	Lake Street; (well No. 2)	250	300	2/9/2001
I5	2559051	Marino Realty II	287 S Randolphville Road	305	100	10/30/2001
I6	2557460	South Plainfield BD of ED	Avon Ave (well No.1)	200	400	2/7/2001
I7	2554487	Inverno, Anthony J	3148 Woodland Ave, South Plainfield, NJ	200	25	1/16/2000

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South Plainfield, New Jersey

No.	Permit No.	Owner	Well Location	Depth (ft)	Capacity (gpm)	Date Permit Issued (or well completed)
	COMMERCIAL					
C1	2526404	JERSEY CONCRETE	Hollywood Ave, South Plainfield, NJ 0780	340	60	7/18/1985
C2	2529498	JENNE ENTERPRIZES	2301 Roosevelt Ave, South Plainfield, NJ 0780	125	10	5/5/1987
	DOMESTIC					
D1	2500061724	PETTY, MATTHEW	1779 Woodland Ave, Edison, NJ 08818	300	35	7/15/2003
D2	2202793	CHEMICAL INSECTICIDE	30 Whitman Ave., Metuchen, NJ	170	33.5	4/24/1957
D3	2500725	CORNELL-DUBILIER ELEC	South Plainfield, NJ	325.5	220	6/29/1950
D4	2501385	BARRA, JANE F.	Mc Donahue Ave., So. Plainfield, NJ	100	10	10/31/1951
D5	2501479	STRONG BLOCK CO, INC	701 North Ave., So. Plainfield, NJ	100	10	1/2/1952
D6	2501630	GUARATEED CONCRETE	Clinton & New Market Ave., South Plainfield, NJ	100	10	3/31/1952
D7	2501832	HOGAN, JOHN	South Plainfield Ave., So. Plainfield, NJ	75	5	6/18/1952
D8	2501903	BINGERT, NICHOLAS	1544 Dumont Ave., So. Plainfield, NJ	125	6	7/21/1952
D9	2501946	CRISCOURLO, ANTHONY	112 Arlington Ave., So. Plainfield, NJ	100	4	8/1/1952
D10	2501954	SMITH, THEODORE	Clinton Avenue	65	3	8/5/1952
D11	2502001	DODDO, G.M.	New Bronswick Ave., New Market, NJ	65	5	8/21/1952
D12	2502504	KRIEGL, JOHN	Metuchen, NJ	90	5	4/6/1953
D13	2502695	COLMAN, WILLIE	2738 Clinton Ave., So. Plainfield, NJ	200	5	4/25/1953
D14	2502731	BARNES, FRANK H. JR	1210 Laneview Terr., Plainfield, NJ	100	10	7/7/1953
D15	2502791	GRIEB, LUCAS, JR	457 Main St.(well - by Westend Ave.), Metuchen	100	4	7/28/1953
D16	2502829	HULEY, ANDREW	615 Kenneth Ave., So. Plainfield, NJ	100	4	8/19/1953
D17	2503151	CORTESE, RALPH	Spicer Ave., (800' from Hamilton Blvd.)	100	6	12/28/1953
D18	2503226	BLADON JR, FREDRICK	Samton Ave. (box 157), So. Plainfield, NJ	65	3	2/8/1954
D19	2503230	RANDOLPH, ALICE E.	Samton Ave., So. Plainfield, NJ	70	3	2/9/1954
D20	2503294	LANDANTE, DOMENICK	Old Post Road, Nixon, NJ	100	5	3/9/1954
D21	2503406	DINSMORE, JOHN	Shevchenko Ave., (1100" from Stelton Road), So. Plainfield, NJ	90	3	4/19/1954
D22	2503417	REESE, AUGUST	Ethel Rd., (1000' from N. Brooklyn Rd.), Metuchen, NJ	100	5	4/23/1954
D23	2503467	RISOLI, NICOLA	2531 Hamilton Blvd., So. Plainfield, NJ	125	5	5/14/1954
D24	2503833	DE STEFANO, JOHN	Box 418 Wood Ave., (2000' from New Dover Rd.), Colonia, Rahway, NJ	100	6	8/18/1954
D25	2504061	CAMPILONGA, JOSEPH	302 Hillside Ave., So. Plainfield, NJ	90	5	11/18/1954
D26	2504185	ZAGROBA, ALFRED	443 Hawthorne Ave., Newark 8, NJ	100	6	1/13/1955

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South Plainfield, New Jersey

No.	Permit No.	Owner	Well Location	Depth (ft)	Capacity (gpm)	Date Permit Issued (or well completed)
DOMESTIC (continued)						
D27	2504553	HARRIS STRCTURAL STL	(South of New Market Ave.), So. Plainfield, NJ	120	10	5/11/1955
D28	2504554	HARRIS STRCTRL STEEL	(South of New Market Ave.), So. Plainfield, NJ	120	10	5/11/1955
D29	2504604	PIETERS, CORNELIUS	24 Sylvan Ave., Metuchen, NJ	90	8	5/25/1955
D30	2504674	CURTIS, FRANK	2030 South Plainfield Ave., Plainfield, NJ	100	10	6/13/1955
D31	2504810	CIFELLI, A	723 Everett St., So. Plainfield, NJ	120	10	7/18/1955
D32	2505224	WUERTHUER, GEORGE	Hamilton Blvd. (500' from S. Clinton Ave.), So. Plainfield, NJ	125	10	11/29/1955
D33	2505248	MUGLIA, JASPER	1955 Terrace Ave., So. Plainfield, NJ	100	6	12/13/1955
D34	2505317	VANBLARCOM,JOSEPHINE	Hollywood Blvd., So. Plainfield, NJ	100	6	1/26/1956
D35	2505398	MOODY, DONALD E	423 Chestnut St. , Newark	100	6	3/5/1956
D36	2505404	HEELMAN, JOHN C	Peer St., So. Plainfield, NJ	0	6	3/7/1956
D37	2505406	MOFFO, JOSEPH	West Hendricks Blvd., So. Plainfield, NJ	0	6	3/7/1956
D38	2505521	RUSSO, DOMINICK	Barrone Ave. , So. Plainfield, NJ	100	6	4/27/1956
D39	2505696	GUSEW, WASILY	305 Spicer Ave., (1500' from Hamilton Blvd.), So. Plainfield, NJ	100	8	6/20/1956
D40	2505868	HARRIS STRCTRL STEEL	(120' South from New Market Rd.) Box 666 Plainfield, NJ	100	10	8/9/1956
D41	2506010	ASTOR MANUFCTRNG CO.	1409 Astor St. (South from New Market Ave.), So. Plainfield, NJ	0	10	9/21/1956
D42	2506318	ROTOLA, MENETT	1000 Jackson Ave., So. Plainfield, NJ	100	6	12/19/1956
D43	2506399	TUFARO, VINCENT	Mc Kinley St. & Durham Ave., So. Plainfield, NJ	100	5	2/4/1957
D44	2506538	DONARUMA, LOUIS	2913 Norwood Ave. (100' South from Adams St.), So. Plainfield, NJ	126	6	3/28/1957
D45	2506586	HARRIS STRCTRL STEEL	So. Plainfield, NJ	100	4	4/17/1957
D46	2506606	HYERS, JAMES M	415 Clifford St. (200' East from Kenyon Ave.), So. Plainfield, NJ	125	6	3/24/1957
D47	2506815	BOSTOS, JAMES	Hamilton Blvd., Lot 18 Middlesex, NJ	140	5	6/28/1957
D48	2506846	GOLLIS, ROBERT	South Ave., So. Plainfield, NJ	124	5	7/8/1957
D49	2506919	TORSKY, JOHN	710 Delmore Ave. (300' South from Hamilton Blvd.), So. Plainfield, NJ	95	10	7/26/1957
D50	2507036	ZIELINSKI, JOSEPHINE	1124 Belmont Ave. So. Plainfield, NJ	90	10	8/30/1957
D51	2507117	GUARANTEE CONCRETE	Clinton Ave. & New Market Ave., So. Plainfield, NJ	125	10	9/24/1957
D52	2507305	PEHANIN, BRAUNIE	153 Clinton Ave., North Plainfield, NJ	120	10	11/12/1957
D53	2507306	PEHANIN, BRAUNIE	154 Clinton Ave., North Plainfield, NJ	120	10	11/12/1957
D54	2507420	PANGBORN, IRA L.	1148 South 10th St., So. Plainfield, NJ	100	5	12/31/1957
D55	2507454	YULICH, CHARLES JR	437 Spicer Ave., So. Plainfield, NJ	100	10	1/16/1958
D56	2507549	FERRANTE, GERALD R	247 Rose St. (Maple Ave., Oak Tree, Edison)	110	8	3/31/1958
D57	2507674	CAPRA, GEORGE C.	So. Plainfield, NJ	138	6	5/29/1958

TABLE 2-2
NJDEP INDUSTRIAL/MUNICIPAL WELL SEARCH
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
South Plainfield, New Jersey

No.	Permit No.	Owner	Well Location	Depth (ft)	Capacity (gpm)	Date Permit Issued (or well completed)
DOMESTIC (continued)						
D58	2507745	HOLY REDEEMER CEMETR	1734 Clinton Ave., So. Plainfield, NJ	100	10	6/18/1958
D59	2508011	DE MARCO, LOUIS	910 Belmont Ave., So. Plainfield, NJ	100	7	9/29/1958
D60	2508116	NOVELLO, NICK	Norwood Ave. (off Maple Ave.), So. Plainfield, NJ	150	12	11/14/1958
D61	2508203	BUTRICO, CHARLES F.	Garibaldi Ave., So. Plainfield, NJ	140	6	12/31/1958
D62	2508228	PISCATELLI, MICHAEL	New york Ave., (west of Hamilton, Blvd.) So. Plainfield, NJ	113	6	1/15/1959
D63	2508230	MARKLE, JOSEPH	275 So. Plainfield Ave., So. Plainfield, NJ	100	11	1/15/1959
D64	2508231	RISOLI, JOHN	Easton Blvd. (South of Hamilton Blvd.), So. Plainfield, NJ	113	6	1/15/1959
D65	2508289	ALMAR BUILDERS, INC.	1242 Foster Ave., SO. Plainfield, NJ (Greenbrook, Union County, NJ)	200	10	2/9/1959
D66	2508305	HARRIS STRUCTURAL ST	So. Plainfield, NJ	100	6	2/24/1959
D67	2508306	HARRIS STRUCTURAL ST	So. Plainfield, NJ	100	6	2/24/1959
D68	2508312	ROMANSKI, MICHAEL	438 Hollywood Ave., So. Plainfield, NJ	80	10	3/2/1959
D69	2508530	SPISSO, ERNEST	Norwood Ave. (175' South of Avon Ave.), So. Plainfield, NJ	85	6	6/3/1959
D70	2508617	COLVIN, FRANK M	Sage St., (250' west of South Clinton Ave.), So. Plainfield, NJ	113	6	7/7/1959
D71	2508638	DENSBY, SAMUEL	30 Regent St., No. Plainfield, NJ	150	20	7/7/1959
D72	2508692	RONZO, ELIZABETH	South of Delmore Ave. 250' east of Lorraine Ave., So. Plainfield, NJ	113	6	7/29/1959
D73	2508804	RANDOLPH, ROBERT JR	Sampson Ave. , So. Plainfield, NJ	100	10	9/11/1959
D74	2508863	JESSOP, JOHN	So. 10th St. south (500' East of New Brunswick Ave), Arbor, NJ	115	300	9/30/1959
D75	2508865	CAVALIERE, HENRY	Sage St. north, (500' west of South Clinton Ave.), So. Plainfield, NJ	115	6	9/30/1959
D76	2508916	MOORE, ARCHIE C.	Good Luck St., Edison, NJ	96	10	10/13/1959
D77	2508979	ZERECONSKI, MILDRED	New York Ave. north, (300' west of Hamilton, Blvd.) So. Plainfield, NJ	200	6	11/2/1959
D78	2508991	SEAMAN, MERTON E	Good Luck St.south, (East of 5th Ave.) Edison, NJ	98	20	11/6/1959
D79	2509045	SHINKLE, ANNA MRS	New York Ave. north, (400' west of Hamilton, Blvd.) So. Plainfield, NJ	130	6	11/30/1959
D80	2509075	TURI, CHARLES A	Somerset Ave. south, (1000' west of Hamilton Blvd.), So. Plainfield, NJ	100	10	12/23/1959
D81	2509212	ZAHUTA JR, ANDREW	West Hendricks Blvd. north, So. Plainfield, NJ	137	6	3/18/1960
D82	2509368	ELKO, ROBERT	Good Luck St. north, (East of 5th Ave.), Edison, NJ	98	15	6/15/1960
D83	2509500	UNEDA REAL ESTATE CO	517 Norwood Ave. east, So. Plainfield, NJ	120	12	8/15/1960
D84	2509517	TURI, CHARLES A	Elliot Place north, (1000' West of Hamilton Blvd.), So Plainfield, NJ	100	10	8/24/1960
D85	2509646	YULICK, RONALD	Garibaldi Ave. 30' south, (100' East of Spicer Ave), So. Plainfield, NJ	120	8	10/24/1960
D86	2509657	ICE PALACE CO INC	Hamilton Blvd. 250' west (1000' North of So. Clinton Ave.), So. Plainfield, NJ	310	60	11/7/1960
D87	2509802	PATTON, JOHN T	463 Wood Ave. 30' west (1500' South of New Dover Rd.), Edison, NJ	102	10	1/6/1961
D88	2510036	COOKE, EDWARD	Metlers Lane west (South of Plainfield Ave.), Piscataway, NJ	103	10	6/13/1961

TABLE 2-2
NJDEP INDUSTRIAL/MUNICIPAL WELL SEARCH
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
South Plainfield, New Jersey

No.	Permit No.	Owner	Well Location	Depth (ft)	Capacity (gpm)	Date Permit Issued (or well completed)
DOMESTIC (continued)						
D89	2510099	TUFARO, VINCENT	Pleasant Ave. 50' East (50' North of Monroe Ave.), So. Plainfield, NJ	145	6	7/12/1961
D90	2510227	SERIDO, TONY	823 George St., Plainfield, NJ	150	5	9/25/1961
D91	2510547	COVELLESIA, PATRICK	50' of Stelton Rd. So. Plainfield, NJ	197	6	4/9/1962
D92	2510674	GRANT, LOUIS	982 Edgewood Rd. , Edison, NJ	160	10	6/7/1962
D93	2510771	ST FRANCIS RECTORY	32 Elm Ave., Metuchen, NJ	296.5	50	7/27/1962
D94	2510865	ROWE, WALTER	1142 Lorraine Ave. (400' North of Spicer Ave.), So. Plainfield, NJ	100	8	9/5/1962
D95	2511068	DUNN, JOHN C JR	Harvard Ave. , So. Plainfield, NJ	100	8	11/19/1962
D96	2511247	COLE, EDWARD	61 Pierce Rd., Metuchen, NJ	110	5	4/24/1963
D97	2511275	CHICARELLI, NORMAN	So. Plainfield, NJ	107	6	5/1/1963
D98	2511629	PAGE, GEORGE	200 Easton Blvd. (800' South of Hamilton Blvd.), So. Plainfield, NJ	200	8	10/24/1963
D99	2513094	LADIS, WILLIAM J	231 Woolworth Ave., So. Plainfield, NJ	100	8	7/19/1965
D100	2513105	HINDLE, JOHN C JR	R.D. 3, Flemington (Readington Twp., Hunterdon), NJ	150	20	7/22/1965
D101	2513378	MANSOLINO, ROBERT	Baldwin Ave. (East of Parker Ave.), So. Plainfield, NJ	150	10	10/25/1965
D102	2513380	CALLEO, ANTHONY	225 West Hendricks Blvd. (West of Park Ave.), So. Plainfield, NJ	150	5	10/25/1965
D103	2513460	CALLEO, ANTHONY L	225 West Hendricks Blvd. (West of Park Ave.), So. Plainfield, NJ	57	12	11/16/1965
D104	2516015	ELLIOTT, ARCHIE W	89 School St.(North of Sutton Lane), Piscataway, NJ	150	15	7/30/1971
D105	2516028	MCDONALD BROS	Roosevelt Ave. (South of So. Plainfield *Ave.*), So. Plainfield, NJ	150	10	7/27/1971
D106	2517070	DETWEILER,CHARLES JR	120 Depot Park (Clark's Lane), Plainfield, NJ	105	20	8/3/1973
D107	2517355	PAWLICKI, STANLEY T	4 Renda Place (620 So. Randolphville Rd.), Piscataway, NJ	160	10	2/21/1974
D108	2518060	GOLBAL DEVELOPMENT C	Rt. 23 West , Plainfield, NJ	120	8	8/26/1975
D109	2518161	GLOBAC DEVELOPMENT	349 Watching Ave. , N. Plainfield, NJ	100	10	11/3/1975
D110	2518868	DOHANYOS, Z.	908 Delmore Ave. Piscataway, NJ	150	10	11/10/1976
D111	2518948	GLOBAL DEVELOPMENT	349 Watching Ave. (Woolworth St. & Victor St.), So. Plainfield, NJ	120	8	12/27/1976
D112	2518949	GLOBAL DEVELOPMENT	349 Watching Ave. (Woolworth St. & Victor St.), So. Plainfield, NJ	130	8	12/27/1976
D113	2518950	GLOBAL DEVELOPMENT	349 Watching Ave. (Woolworth St. & Victor St.), So. Plainfield, NJ	140	8	12/27/1976
D114	2518951	GLOBAL DEVELOPMENT	349 Watching Ave. (Woolworth St. & Victor St.), So. Plainfield, NJ	100	8	12/27/1976
D115	2518952	GLOBAL DEVELOPMENT	349 Watching Ave. (Woolworth St. & Victor St.), So. Plainfield, NJ	110	8	12/27/1976
D116	2518953	GLOBAL DEVELOPMENT	349 Watching Ave. (Woolworth St. & Victor St.), So. Plainfield, NJ	160	8	12/27/1976
D117	2519105	VOCISANO, L.	Dunellen Ave., Piscataway, NJ	125	10	4/25/1977
D118	2519106	VOCISANO, L.	Dunellen Ave., Piscataway, NJ	125	10	4/25/1977
D119	2519392	GLOBAL DEVELOPMENT	300 Maple Ave., New York Ave. , So. Plainfield, NJ	110	5	8/2/1977

TABLE 2-2
NJDEP INDUSTRIAL/MUNICIPAL WELL SEARCH
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
South Plainfield, New Jersey

No.	Permit No.	Owner	Well Location	Depth (ft)	Capacity (gpm)	Date Permit Issued (or well completed)
DOMESTIC (continued)						
D120	2519393	GLOBA DEVELOPMENT	300 Maple Ave., Camden Ave. , So. Plainfield, NJ	120	5	8/2/1977
D121	2519502	GLOBAL DEVELOPMENT	300 Maple Ave., , So. Plainfield, NJ	100	10	9/19/1977
D122	2519503	GLOBAL DEVELOPMENT	300 Maple Ave., , So. Plainfield, NJ	100	10	9/19/1977
D123	2519504	CUACIO, JAMES	New York Ave. & Hamilton Blvd., SO. Plainfield, NJ	100	10	9/19/1977
D124	2519505	GLOBAL DEVELOPMENT	300 Maple Ave., , So. Plainfield, NJ	100	10	9/19/1977
D125	2520170	GLOBAL DEVELOPMENT	150 Somerset St. , So. Plainfiel, NJ	110	10	7/18/1978
D126	2520350	GASTER, JOHN	260 Fairland Ave. , So. Plainfield, NJ	100	10	10/17/1978
D127	2520670	JANUS, RONALD	Hamilton Blvd. , So. Plainfield, NJ	150	10	5/7/1979
D128	2520857	KOKO KOLA BLDRS	R.D. 1, Whitehouse Sta. (Clinton Twp., Hunterdon Cty.), NJ	480	10	8/2/1979
D129	2520862	TRA/LYN CONST. CO.	174 Dunellen Ave. (500' South of First St.), Piscataway, NJ	100	10	7/31/1979
D130	2520980	PLAINFIELD CURLING C	133 Mc. Kinnley St. (East of Durham Ave.), So. Plainfield, NJ	200	15	9/20/1979
D131	2521058	CORALLO BROS. INC.	707 Sampton Ave. So. Plainfield, NJ	185	20	10/16/1979
D132	2521332	PELLEGRINO, John	512 Anthony Ave., So. Plainfield, NJ	125	10	4/24/1980
D133	2521406	PETTI, M.	1779 Woodland Ave., Edison, NJ 08817	150	15	6/10/1980
D134	2521521	JANVER BLDR. INC.	133 Camden Ave. , So. Plainfield, NJ	200	10	8/14/1980
D135	2521522	JANVER BLDR. INC.	133 Camden Ave. , So. Plainfield, NJ	125	10	8/14/1980
D136	2521571	MASTRIANNI, PATRICK	507 Boundbrook Rd., , So. Plainfield, NJ	175	10	9/9/1980
D137	2521588	ZUSHMA, MICHAEL	1130 Belmont Ave. (North of Rahway Ave.), So. Plainfield, NJ	150	10	9/15/1980
D138	2522109	WOOD CONST. CO.	122 Avon Ave. , So. Plainfield, NJ	150	10	5/28/1981
D139	2522615	D. DI GIAN & SON	20' East of Rush Ave. & 75' North of Camden Ave., So. Plainfield, NJ	150	10	3/9/1982
D140	2523261	MORETTI, GUY	2132 Audubon Ave. (South of Smith & 400' East of Hamilton Blvd.), NJ	118	8	9/27/1982
D141	2523946	SULLIVAN, SYLVESTER	1570 So. Washington Ave. , Piscataway, NJ	175	10	6/2/1983
D142	2524382	KAYS, JOE	60 Roberts Ave. (100' West of Kossuth St.), Piscataway, NJ	170	5	10/18/1983
D143	2524448	CELENTANO, JULIUS	12 Celentano Ct. (North & 75' East of Rush St.), So. Plainfield, NJ	150	10	11/2/1983
D144	2524955	WILSON, DONALD	112 Ralph Ave. , So. Plainfield, NJ	160	8	4/26/1984
D145	2525605	KNIGHT, FRANK	650 E 6th St. , So. Plainfield, NJ	130	10	10/5/1984
D146	2525751	CAMPAGNA, PHILIP	216 Adeline Avenue , So. Plainfield, NJ	150	10	1/15/1985
D147	2525830	HUNTER, ROBERTA	127 Front St. , So. Plainfield, NJ	150	10	12/20/1984
D148	2526179	DEVELOPMENT CORP.	900 Woodbridge Center Dr. , Woodbridge, NJ	200	10	4/30/1985
D149	2526180	DEVELOPMENT CORP.	900 Woodbridge Center Dr. , Woodbridge, NJ	150	10	4/30/1985
D150	2526181	DEVELOPMENT CORP.	900 Woodbridge Center Dr. , Woodbridge, NJ	200	10	4/30/1985

TABLE 2-2
NJDEP INDUSTRIAL/MUNICIPAL WELL SEARCH
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
South Plainfield, New Jersey

No.	Permit No.	Owner	Well Location	Depth (ft)	Capacity (gpm)	Date Permit Issued (or well completed)
DOMESTIC (continued)						
D151	2527382	WOOD,SAL	122 Avon Ave. , So. Plainfield, NJ	170	10	1/10/1986
D152	2527890	MODITZ,BRUCE	West of Rush St. & South of Camden Ave., So. Plainfield, NJ	175	10	5/22/1986
D153	2527891	MODITZ,BRUCE	West of Rush St. & South of Camden Ave., So. Plainfield, NJ	175	10	5/22/1986
D154	2528345	DI GIAN & SON CONST.	308 Arlington Ave., So. Plainfield, NJ 07080	150	10	8/18/1986
D155	2528490	RECIFO,FRANK	222 Barone Ave. (West of Hamilton Blvd.), So. Plainfield, NJ 07080	125	10	9/10/1986
D156	2528492	RECIFO,FRANK	222 Barone Ave. (West of Hamilton Blvd.), So. Plainfield, NJ 07080	150	10	9/10/1986
D157	2529460	BUCCELLATO,JOSEPH	761 Johnston Drive, Watchung, NJ 07060	200	10	4/15/1987
D158	2529539	BARLETTA,ALEX	136 W Elmwood Drive, So. Plainfield, NJ	140	10	5/13/1987
D159	2529696	CAMPAQWA,PHIL	246 Adeline Ave. , So. Plainfield, NJ 07080	150	10	6/4/1987
D160	2530346	DIGIAN LAND & DEVEL.	31 U. Mountain Blvd., Warenville Plaza, Warren, NJ 07060	145	10	9/28/1987
D161	2530603	ADAMS, JOHN	1203 New Brunswick Ave. (South of 10th St.), So. Plainfield, NJ 07080	200	10	11/13/1987
D162	2530767	DIGIAN & SON CONST C	31 U. Mountain Blvd., Warenville Plaza, Warren, NJ 07060	165	10	12/3/1987
D163	2532022	BUTRICO, FRANK	2507 NEew Brunswick Avenue , So. Plainfield, NJ	160	10	7/19/1988
D164	2532244	ROSAMILIA,ANTHONY	257 Gemini Drive 3A, Somerville, NJ 08876	150	10	8/22/1988
D165	2532765	WAGNER, ERIC	1619 Grier Ave., Linden, NJ 07036	200	10	11/23/1988
D166	2532832	CILLIS, JOSEPH JR	1521 Sage Street, So. Plainfield, NJ 07080	130	10	12/15/1988
D167	2533202	PETTI,MATTHEW,DR.	1779 Woodland Avenue Edison, NJ 08820	150	10	3/8/1989
D168	2533861	MYRUSH,STEVE	29 King St. Edison, NJ 08820	165	10	6/12/1989
D169	2534157	ZWOLAK, FRANK MR.	318 Belmont Avenue, So. Plainfield, NJ	160	10	7/25/1986
D170	2541312	SEEMAN DEVELOPMENT	190 Rte 27, Edison, NJ 08802	200	10	5/21/1992
D171	2601215	MCDOWELL, JULIA	Sunset Ave. , Metuchen, NJ	100	10	6/27/1955

TABLE 2-3

MIDDLESEX WATER COMPANY - WATER ALLOCATION PERMIT QUARTERLY REPORTS DATA SUMMARY

CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE

South Plainfield, New Jersey

Time Period	Permit No.	Wells Well Permit No.	Available Information
1936 - 1952	31	N/A	Total diversion from original source in Thousand Gallons per Minute (TGM), Total received from /diverted to other systems (TGM), Total consumption in respondent's territory (TGM)
1953 - 1954	31	Park Ave. Station So. Plainfield Station	
1955 - 6/1956	31	Park Ave. Station So. Plainfield Station Tingley Lane Station	
7/1956 - 12/1959	31	Park Ave. Station So. Plainfield Station Tingley Lane No. Station Tingley Lane So. Station	
1/1960 - 4/1963	31	Park Ave. Station So. Plainfield Station Tingley Lane No. Station Tingley Lane So. Station	Diversion from own sources (TGM), Received from /diverted to other systems (TGM), Net diversion for territory served (TGM)
5/1963 - 5/1966	31	Park Ave. Station So. Plainfield Station Tingley Lane No. Station Tingley Lane So. Station Sprague Ave. Station Maple Ave. Station	
6/1966 - 12/1969	31	Park Ave. Station So. Plainfield Station Tingley Lane No. Station Tingley Lane So. Station Sprague Ave. Station Maple Ave. Station Maplewood Ave. Station: 1187 Spring Lake Station	
1/1970 - 12/1975	31	Park Ave. Station So. Plainfield Station Tingley Lane No. Station Tingley Lane So. Station Sprague Ave. Station Maple Ave. Station Maplewood Ave. Station: 1187 Spring Lake Station Thermal Well	
1/1976 - 12/1983	31	Park Ave. Station Tingley Lane No. Station Tingley Lane So. Station Sprague Ave. Station Maple Ave. Station Maplewood Ave. Station: 1187 Spring Lake Station Thermal Well	
1984 no static water level data for II[nd] Quarter	31	784 913 1111 1112 1210 Maplewood Ave Well - 1187 - abandoned 12/12/84 1327	Diversion from own sources (TGM), Received from /diverted to other systems (TGM), Net diversion for territory served (TGM), Static Water Level data
1985	31	784 913 1111 1112 1210 1327	

TABLE 2-3
MIDDLESEX WATER COMPANY - QUARTERLY REPORTS
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
South Plainfield, New Jersey

Time Period	Permit No.	Wells Well Permit No.	Available Information
1/1986 - 12/2002	5293	Tingley La.#1: 25-408	
		Tingley La.#2: 25-3970	
		Tingley La.#3: 25-2008	Diversion from own sources: Wells (TGM)
		Tingley La.#4: 25-2009	Wells - Water Level (ft)
		Tingley La.#5: 25-4516	Site Elevation (data available since 1988)
		Tingley La.#6: 25-4517	Total Head (data available since 1989)
		Tingley La.#7: 25-5432	Individual Well usage (data available since 1990)
		Tingley La.#8: 25-5637	
		Tingley La.#9: 25-5965	
		Thermal Well: 25-13518	
1/2003 - 6/2005	5293	Well 1: WSWL 64792-2500000408 [1]	
		Well 2: WSWL 64830-2500003970	
		Well 3: WSWL 64809-2500002008	
		Well 4: WSWL 64810-2500002009	Water diverted (MGM) -
		Well 5: WSWL 64838-2500004516	Million Gallons on monthly basis
		Well 6: WSWL 64839-2500004517	Static Water Level (ft)
		Well 7: WSWL 64852-2500005432	
		Well 8: WSWL 64853-2500005637	
		Well 9: WSWL 64859-2500005965	
		Thermal: WSWL 64989-2500013518	
1/1986 - 12/2002	5294	Maple Ave.: 25-1001	
		Sprague Ave.#1: 25-9603	
		Sprague Ave.#2: 25-11464	
inactive since 1/2000 -		Spring Lk.#5: 25-11823	
inactive since 5/2000 -		Spring Lk.#6: 25-11828	
		Spring Lk.#8: 25-12364	
		Spring Lk.#9: 25-12365	
		Park Ave.#18: 45-274	
		Park Ave.#19: 45-275	Diversion from own sources: Wells (TGM)
		Park Ave.#20: 45-276	Wells - Water Level (ft)
		Park Ave.#21: 45-277	Site Elevation (data available since 1988)
		Park Ave.#22: 45-278	Total Head (data available since 1989)
		Park Ave.#23: 25-9763	Individual Well usage (data available since 1990)
		Park Ave.#24: 45-279	
		Park Ave.#25: 25-11815	
		Park Ave.#26: 25-11816	
		Park Ave.#27: 25-11822	
		Park Ave.#28: 25-12119	
		Park Ave.#29: 25-12120	
		Park Ave.#30: 25-12130	
		Park Ave.#31: 25-12461	
		Park Ave.#32: 25-12131	

TABLE 2-3
MIDDLESEX WATER COMPANY - QUARTERLY REPORTS
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
South Plainfield, New Jersey

Time Period	Permit No.	Wells Well Permit No.	Available Information
1/2003 - 6/2005	5294	Maple Ave 1: WSWL 64907-2500010001	
		Sprague Ave 1: WSWL 64901-2500009603	
		Sprague Ave 2: WSWL 64924-2500011464	
		Spring Lk 5: WSWL 64939-2500011823	
		Spring Lk 6: WSWL 64940-2500011828	
		Spring Lk 8: WSWL 64955-2500012364	
		Spring Lk 9: WSWL 64956-2500012365	
		Park Ave 18: WSWL 69979-4500000274	
		Park Ave 19: WSWL 69980-4500000275	
		Park Ave 20: WSWL 69981-4500000276	Water diverted (MGM) -
		Park Ave 21: WSWL 69982-4500000277	Million Gallons on monthly basis
		Park Ave 22: WSWL 69983-4500000278	Static Water Level (ft)
		Park Ave 23: WSWL 64905-2500009763	
		Park Ave 24: WSWL 69984-4500000279	
		Park Ave 25: WSWL 64935-2500011815	
		Park Ave 26: WSWL 64936-2500011816	
		Park Ave 27: WSWL 64938-2500011822	
		Park Ave 28: WSWL 64947-2500012119	
		Park Ave 29: WSWL 64948-2500012120	
		Park Ave 30: WSWL 64949-2500012130	
		Park Ave 31: WSWL 64958-2500012461	
		Park Ave 32: WSWL 64950-2500012131	

Note: [1] - Wells 1 - 4 - North Tingley Lane and wells 5 - 9 - South Tingley Lane

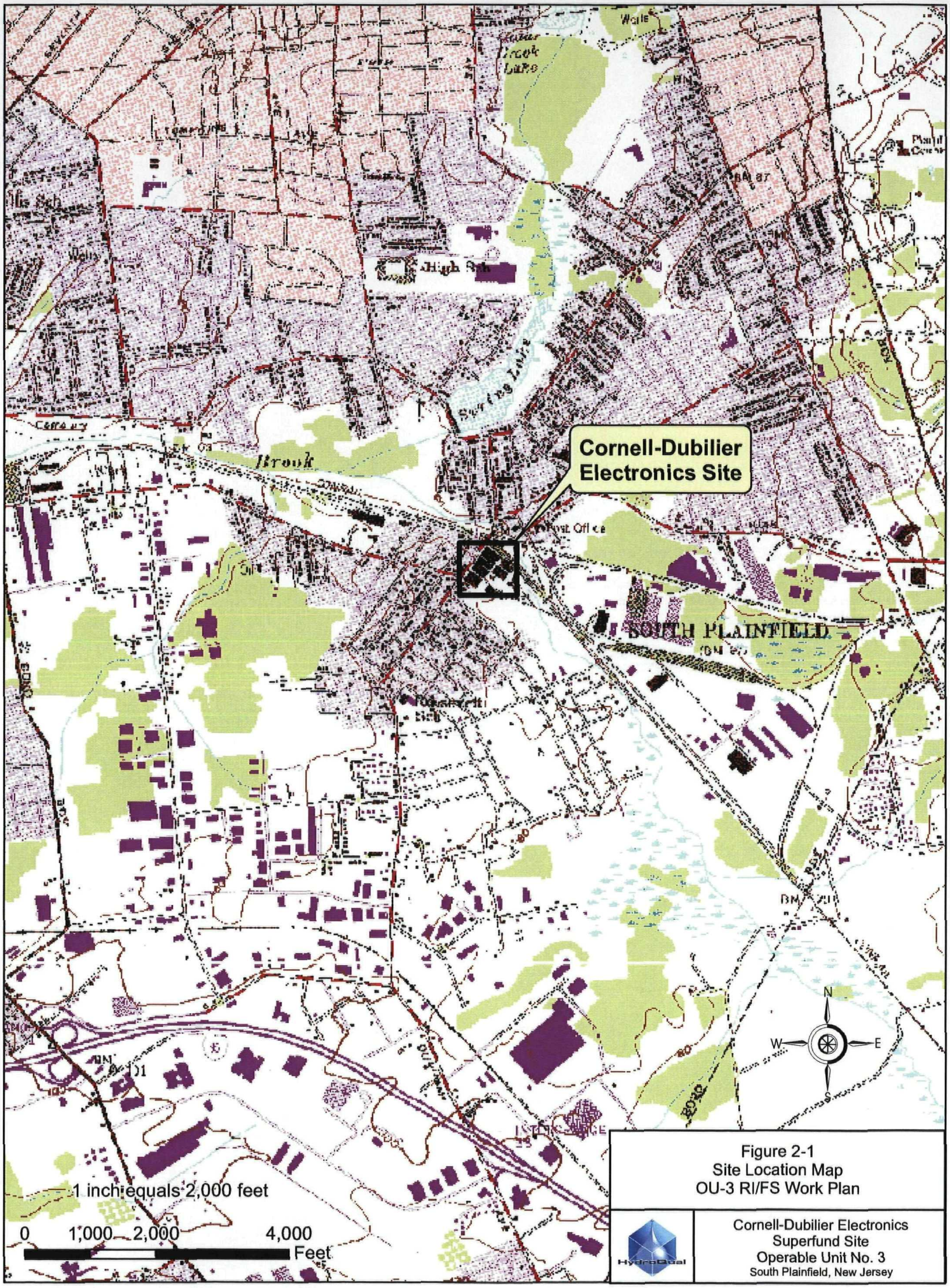


Figure 2-1
Site Location Map
OU-3 RI/FS Work Plan

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

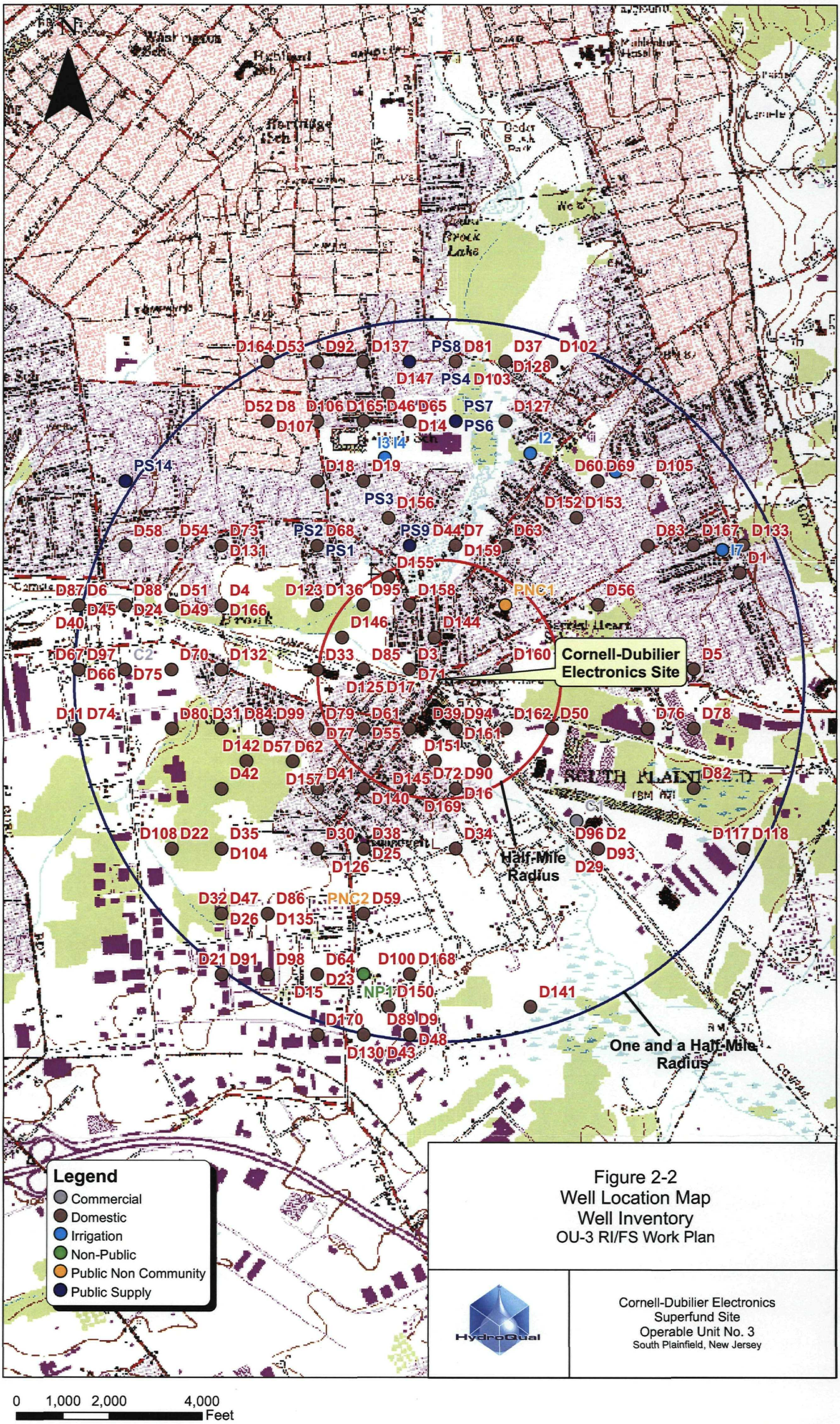


Figure 2-2
Well Location Map
Well Inventory
OU-3 RI/FS Work Plan

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

SECTION 3

CONCEPTUAL SITE MODEL (CSM)

A Preliminary Conceptual Site Model report was submitted to the USEPA on September 19, 2005, in accordance with the terms of the Settlement Agreement. USEPA reviewed the report and provided comments in a letter dated December 6, 2005. The Preliminary Conceptual Site Model has been revised in response to the Agency's comments and is provided as an attachment to this Work Plan (Attachment C). To facilitate review of this Work Plan, a summary of the Preliminary Conceptual Site Model (CSM) is presented below. For additional detail, reference should be made to Attachment C.

The CSM represents an evolving understanding of the Site hydrogeology, groundwater flow, and contaminant migration based upon the body of knowledge at any given time. At this time, the hydrogeologic setting and the current CSM are characterized by the following:

- The overburden in the area of the Site is relatively thin and largely unsaturated, and is comprised of low permeability soils. Some areas of perched groundwater exist within the overburden soils.

- Measured surface water elevations of the Bound Brook, to date, are above the potentiometric surface elevations measured in existing wells in the underlying Passaic Formation bedrock suggesting that Bound Brook may not serve as a discharge point for bedrock groundwater. Current data suggest that the extensive array of groundwater supply wells to the north are having a significant influence on groundwater elevation and flow direction.

- The Site is underlain by fractured rock of the Passaic Formation as illustrated in Figure 3-1. The rock in this area strikes roughly northeast/southwest and dips to the northwest at about 8 degrees.

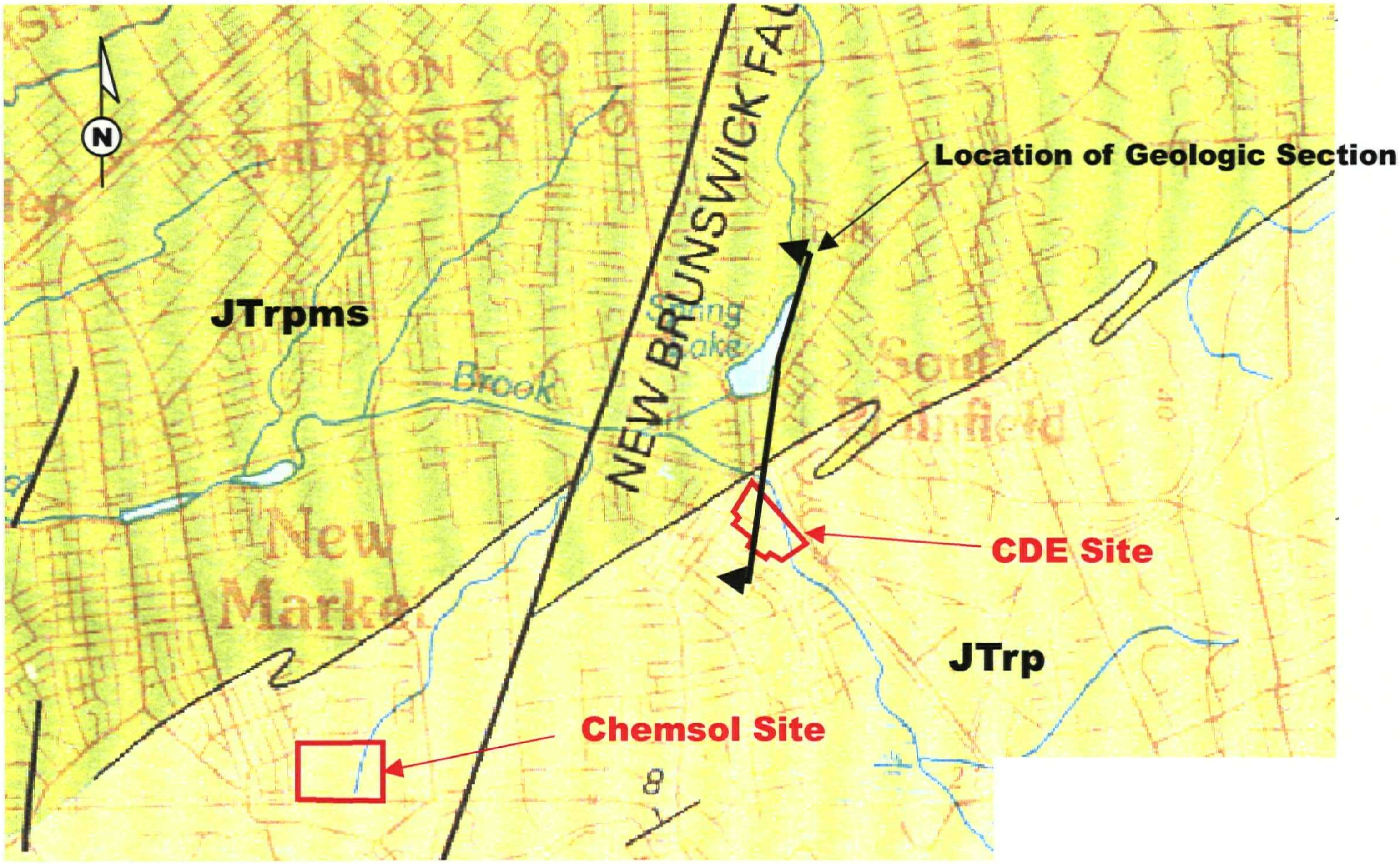
- The upper 30 to 50 feet of the Passaic Formation is typically weathered and of generally low permeability. However, at greater depth, the Passaic Formation serves as a major water supply aquifer in the area. Numerous water supply wells are situated north of the Site along a broad swath of the aquifer south of the Watchung Ridge. These wells, along with their well head protection areas, are depicted on Figure 3-2. Pumping of these wells (rate, duration, zone/depth) can have a significant impact on groundwater flow direction.

- The closest of these water supply wells are three Middlesex Water Company wells located at Spring Lake. The southernmost of these wells are less than 2,000 feet from the Site. The location of these wells relative to the Site is illustrated in Figure 3-3, which depicts a northwest cross-section through the Site and the two water supply wells along the east side of Spring Lake.

- The Passaic Formation often exhibits a higher hydraulic conductivity along the direction of strike, which in this case is roughly northeast/southwest. This common characteristic of the Passaic Formation (as well as many other fractured rock aquifers) is referred to as areal anisotropy and is an important factor in controlling groundwater flow direction in this aquifer. The magnitude of this anisotropy will likely be an important factor in understanding groundwater flow direction.

- The Passaic Formation is composed of porous sandstone, shale and mudstone. Consequently, matrix diffusion of contaminants into and out of the rock's matrix will be a key factor governing contaminant migration in this formation.

- TCE and other solvents are widespread within the Passaic Formation aquifer in this area. While the Site exhibits significant levels of TCE in its groundwater monitoring well network, there are also outlying areas of TCE contamination, and other solvents, in former private water supply wells. The source(s) of these outlying areas of contamination is unclear at this point and their relationship to the contaminants emanating from the Site will be clarified during the RI/FS.



Approximate Scale: 1 in = 3425 ft

Legend

Mudstone Facies of Passaic fm

Passaic fm

8 Dip in Degrees

Strike of Formation

Figure 3-1
Bedrock Geologic Map
OU-3 RI/FS Work Plan

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

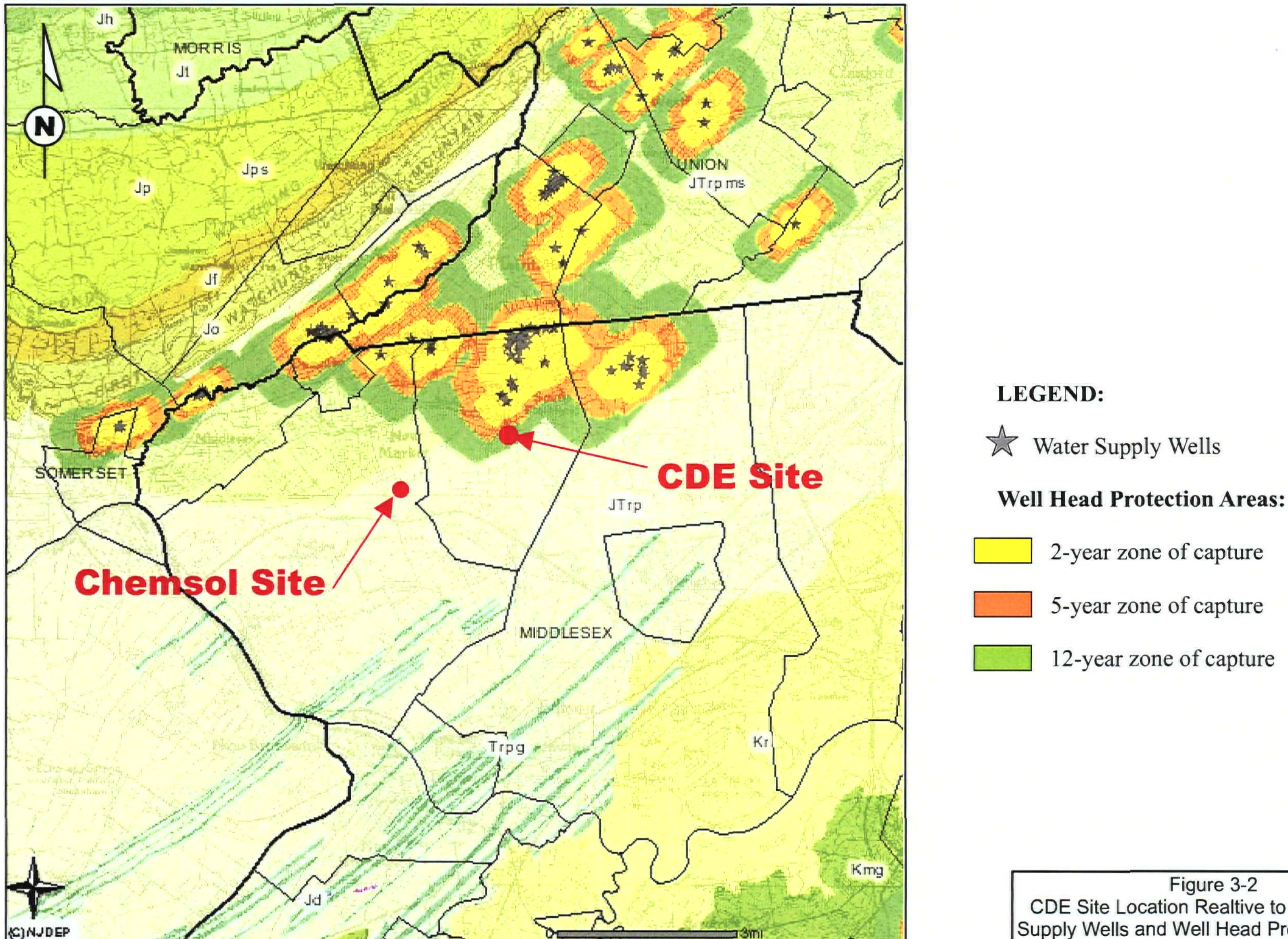


Figure 3-2
CDE Site Location Realtive to Major Water Supply Wells and Well Head Protection Areas
OU-3 RI/FS Work Plan

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

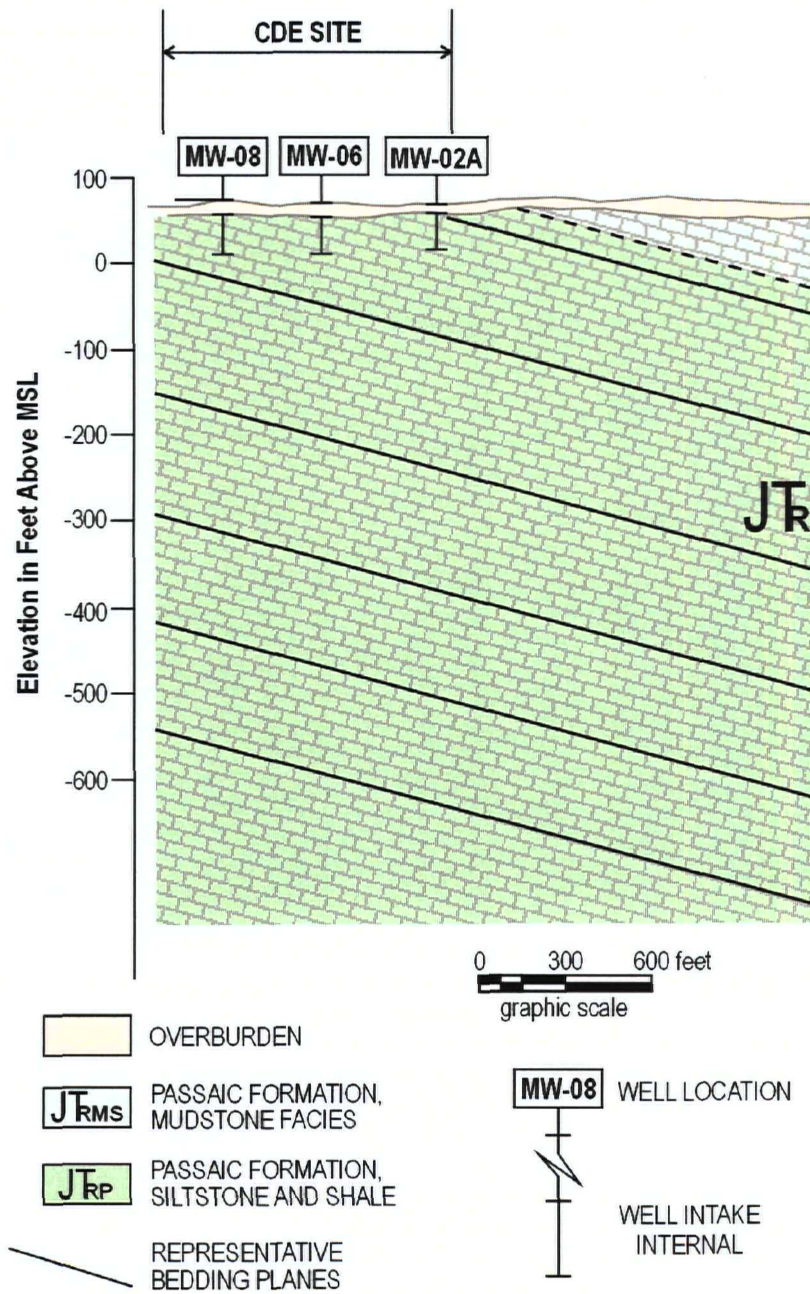


Figure 3-3
North-South Geologic Section
OU-3 RI/FS Work Plan

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

SECTION 4

SCOPE OF WORK

4.1 INTRODUCTION

The following sections present the scope of work to be completed under this Work Plan and are structured consistent with the tasks called for in the Settlement Agreement and more particularly in the Statement of Work (SOW) attached to the Settlement Agreement. For each task, three subsections are included that describe the purpose of the task, the approach or technical rationale for how the work will be completed, and a description of the work and/or deliverable(s) associated with the task. This Work Plan addresses Task I of the SOW and consists of the Work Plan per se and the accompanying documents required by the SOW: (1) a Field Sampling Plan/Quality Assurance Project Plan (FSP/QAPP) and (2) a Health and Safety Plan (HASP). Specific tasks are discussed below, presented in the order in which they are called for in the SOW. SOW Task II, Community Relations, is not discussed further in this Work Plan because the USEPA has developed and is implementing a Community Relations Plan, and Task II simply provides for information to be supplied by Dana, at the request of USEPA, in support of the community relations program.

4.2 SITE CHARACTERIZATION (SOW TASK III)

4.2.1 Purpose

The purpose of this task, as defined by the SOW, is to collect the data necessary to understand the Site's hydrogeology, migration pathways, and the nature and extent of groundwater contamination associated with the Site. In addition, the purpose of the soil gas/indoor air survey components of the work is to evaluate the potential for vapor migration of VOCs from groundwater and the potential for indoor air exposure at properties in the vicinity of the Site. Initially, exterior soil gas surveys will be used to map areas surrounding the Site to focus subsequent indoor air quality investigations (described in Section 4.2.3.2). The results of the soil gas survey will also be used to modify or adjust the selection of groundwater monitoring well locations, if appropriate.

The Site characterization data collected during this field investigation and the prior investigations will be used to assess contaminant fate and transport, and to support the evaluation of potential risk of exposures to Site-related contaminants. Given the nature of the area surrounding the Site, as discussed in the Preliminary Conceptual Site Model, an ancillary purpose of this task is to also understand the inter-relationship of the Site with other potential sources of groundwater contamination, if any.

More specifically, the SOW objective of "understanding the nature and extent of groundwater contamination at the site" will be met through evaluation of concentration gradients, Site specific constituents (when present), hydrogeologic characteristics of the underlying Passaic Formation (anisotropy, transmissivity, matrix porosity, diffusion coefficients, etc.), historic and current groundwater use, contaminant mobility, etc. While the understanding of these factors should always be part of the investigation decision making process, they are especially critical to this investigation due to the regional VOC impacts to groundwater as discussed in the Preliminary Conceptual Site Model and as illustrated in Figure 4-1. While the data indicate TCE in groundwater associated with the CDE Site, the data also provide evidence of TCE concentrations reported to the west-southwest and southwest of the Site, and at generally low concentrations (on the order of 10 ppb), interspersed throughout the surrounding area. Finally, other VOCs, such as MTBE, 1,1,1-TCA and others, are detected at various locations throughout the surrounding area, and based on current data do not appear to be associated with the Site. These data, compiled from various sources, indicate that collection of groundwater samples in the area that have non-detectable levels of VOCs is unlikely and that regional concentrations of TCE and it's degradation products should be anticipated, and planned for, as part of the Work Plan process.

Therefore, it may be that the objective of defining the extent of the plume associated with the Site cannot be met by defining groundwater concentrations to non-detectable levels or regulatory criteria (e.g., NJ Groundwater Quality Standards), depending on regional background concentrations. Under such circumstances, the nature and extent of the plume would be assessed based on comprehensive evaluation of the data collection efforts identified in this Work Plan. The Scope of Work presented and discussed below is designed to meet the objectives of the Settlement Agreement while also considering the context of regional groundwater quality.

4.2.2 Approach

4.2.2.1 Overview

The fieldwork conducted for this investigation will be performed using the Triad Approach, which calls for a dynamic work plan that is based upon established standard operating procedures (SOPs) and decision criteria for the collection and evaluation of field screening data. The critical decision points associated with this field investigation relate to assessing the potential for a complete soil gas to indoor air pathway and the horizontal and vertical location of permanent monitoring points for groundwater characterization.

Implementing these critical decision points will require evaluation of data in the field, so that the objectives of the investigation can be met in an effective and efficient manner.

The field work will be initiated with completion of the Stage 1 soil gas survey followed by the drilling program, additional soil gas/sub-slab and indoor air sampling, as applicable, aquifer testing, evaluation of surface water/groundwater interaction, and water quality sampling. The technical rationale and approach to be employed for completion of these activities, and the criteria that will be employed as part of the Triad Approach, are discussed in the following sections. Details regarding implementation of the work and application of the established criteria are discussed in Section 4.2.3. By way of summary, the key decision points and associated decision criteria may be summarized as follows:

- Stage 1 soil gas sampling results: Presence or absence of VOCs above screening criteria to be used to assess the need for an expanded soil gas survey (i.e., Stage 2 survey), identify locations for sub-slab/indoor air sampling, and to refine the locations of monitoring wells.
- Stage 2 soil gas sampling: Presence or absence of VOCs above screening criteria to be used, in combination with Stage 1 data, to assess the need for additional sub-slab/indoor air sampling.
- Sub-slab/indoor air sampling data: To be used to assess the potential for a complete soil gas to indoor air pathway.
- Bedrock monitoring well locations: May be shifted from proposed locations in response to soil gas screening results, as applicable.
- Screened intervals of bedrock monitoring wells: Hydraulic conductivity and VOC screening data to be used to select monitoring intervals, with a maximum depth preset to 450 feet based on the understanding of groundwater flow and regional groundwater pumping.
- Intermediate well casings: VOC data collected in the field to be used to select the points at which intermediate casings are set.

4.2.2.2 Soil Gas Survey and Indoor Air Investigation

The approach to the soil gas and indoor air evaluation is targeted to sequential collection of data so that subsequent steps in the investigation will be refined based on collected data. The soil gas work will be performed first. The area targeted for the soil gas survey includes the residential neighborhoods located immediately southwest, west and north of the Site. The soil gas investigation will consist of an initial survey, which is defined by the Stage 1 areas as illustrated on Figure 4-2. The Stage 1 areas are biased to be immediately downgradient/sidegradient (with respect to bedrock groundwater) of the Site, where data available to date indicate the highest measured concentrations of VOCs in groundwater. Stage 2 sampling would be performed, if necessary and appropriate, for further soil gas characterization, based on the data collected from the Stage 1 sampling. To avoid demobilizations and remobilizations and to employ effectively the principles of the Triad approach, decisions regarding Stage 2 sample locations, if any, are planned to be made in the field. As data are collected, they will be evaluated, summarized, and transmitted to the USEPA via electronic mail along with recommendations for Stage 2 sample locations, if any, and the desired response time for input from the USEPA so that the field efforts may continue uninterrupted. In addition to the field analyzed samples, a subset of samples will be submitted to the laboratory for analysis, as a quality assurance measure for the field program.

As a final step in the evaluation of potential vapor intrusion, sub-slab samples and indoor air samples will be collected based on the results of the soil gas survey. Decisions on indoor air sampling locations will be made in concert with the USEPA.

4.2.2.3 Groundwater Investigation

On the basis of existing groundwater data and subsequent discussion and agreement with USEPA during development of the Statement of Work (SOW), ten locations, MW-100 through MW-109 (formerly designated in the SOW as MW-A through MW-J) have been tentatively identified for the installation of monitoring wells as illustrated in Figure 4-3. These locations may be modified to some degree in the field based upon access constraints and the results of the soil gas survey discussed above. However, the general locations are expected to remain consistent with that illustrated in Figure 4-3 and the respective objective(s) associated with each of the tentative locations are as follows:

MW-100 (MW-A) – This location will be completed near existing well MW-06 and is intended to characterize the on-Site vertical extent of groundwater impacts. Groundwater samples for field screening analysis will be collected during drilling (discussed further below) to aid in the selection of intermediate casing depths and final completion depth.

MW-101 (MW-B) – This well is located upgradient (southeast) of the Site and is intended to characterize background water quality. The location of this well has also been selected based on mapped wetlands in the area. As illustrated on Figure 4-4, the proposed location is positioned outside of wetlands boundaries to simplify permitting or permit equivalency issues.

MW-102 (MW-C) – This well is also located upgradient but to the east-southeast of the Site and is also intended to characterize background water quality.

Both of these locations (MW-101 and MW-102) will include a shallow bedrock monitoring well completed at the depth at which water is first encountered in the rock (estimated at approximately 30 – 50 feet below ground surface). A deep bedrock well will also be installed at one or both of these locations depending on the observed total volatile organic (TVO) concentration obtained from field screening analysis in the shallow bedrock interval at these locations. The depth of the deep boring will be selected based upon the depth of MW-100 and additional field screening analysis.

MW-103 and MW- 104 (MW-D and MW-E) – These two well locations are intended to provide additional water quality and water level information in the area previously investigated by NJDEP to characterize existing groundwater contamination in this area. The wells would be completed within the upper 30 to 50 feet of bedrock consistent with the other shallow bedrock wells to be completed during this investigation.

MW-105 (MW-F) – This location has been selected for a shallow bedrock monitoring well (30 –50 feet below ground surface) to characterize groundwater quality immediately side gradient (west-southwest) of the Site. The tentative location is between domestic wells and on-Site well MW-08 that have previously reported elevated TVO concentrations and domestic wells further to the west-southwest with lower reported TVO concentrations.

MW-106 (MW-G) – This location has been selected for a shallow bedrock monitoring well (30 –50 feet below ground surface) to characterize groundwater quality immediately side gradient of the Site to the northeast. This well is intended to assess the generally low TVO concentrations reported in on-Site wells MW-02 and MW-03.

MW-107 (MW-H) – This location is intended to characterize groundwater impacts downgradient of the Site and would include a shallow bedrock well in the upper 30 to 50 feet below ground surface and a deep bedrock monitoring well. The depth of intermediate casings and final completion depth of the deep well will be based upon field screening for TVO concentration (discussed further below) and the results obtained from MW-100.

MW-108 (MW-I) – This location has been selected for a shallow bedrock monitoring well (30 –50 feet below ground surface) to further characterize groundwater quality downgradient from the Site.

MW-109 (MW-J) - This location is intended to characterize groundwater impacts downgradient of the Site and would include a shallow bedrock well in the upper 30 to 50 feet below ground surface, as well as a deep bedrock monitoring well. The depth of intermediate casings and final completion depth of the deep well will be based upon field screening for TVO concentration (discussed further below) and the results obtained from MW-100.

The selection of the screened interval for each of the monitoring wells identified above will be based upon identifying water-bearing zones within the rock, as dictated by stratigraphy and fracture orientation, and the relative magnitude of TVO concentrations with depth. These are decisions that need to be made in the field (Triad Approach) so that the resulting array of monitoring points are positioned to meet the objectives of the investigation (i.e., delineation of groundwater impacts).

The identification of water-bearing units within the underlying Passaic formation will be accomplished through the collection of rock core, downhole geophysical logging, including caliper, gamma, temperature, fluid resistivity, and acoustical televiewer logs, if applicable (discussed below); and packer testing at ten foot intervals to measure hydraulic conductivity within the borehole. In addition, groundwater samples will be collected at 30 to 50 foot intervals at each borehole location and analyzed in the field to provide estimated TVO concentrations with depth.

The TVO concentration profiling will be accomplished by field screening of groundwater samples for TVO concentrations using the Color-Tec method marketed by A.P. Buck, Inc. Color-Tec is a field based analytical method that combines the use of colorimetric gas detector tubes with sample purging to detect part per billion (ppb) concentrations of chlorinated compounds in groundwater and soil. The method is semi-qualitative (i.e., provides approximate concentrations) and is intended to provide fast, low level (concentration), decision-quality data. The gas detector tubes react positively to chlorinated alkenes (the principal compounds of interest at the Site) and to a lesser degree, chlorinated alkanes. Therefore, the response indicated by the gas detector tube represents the sum of the concentration of each individual chlorinated compound present in the sample.

The results recorded from the scale printed on the gas detector tube can be correlated to results obtained from laboratory analysis from published literature and from comparison to Site-specific duplicate samples. While correlation will be completed, this is not the intended use of the data. Rather, it is intended as a qualitative means to assess the relative magnitude of chlorinated solvent concentrations with depth at a given borehole location. Relative changes in concentrations, as read directly from the gas detector tubes, will be used to determine when to set a casing. Similarly, a minimum concentration on the gas detector tube has been selected based upon published correlation at sites containing the same compounds as those reported at the Site, as the criteria for determining when to stop drilling.

By collecting groundwater samples during the drilling program that are analyzed in the field, critical decisions can be made regarding the need for, and depth of, intermediate casings at the deep well locations and assist in determining the total depth at each location.

These decisions can be made in real time, without the need for multiple phases of investigation or extended periods of "down" time waiting for laboratory results. In addition, the collection of field screening samples at selected intervals throughout the depth of a given borehole provides a vertical profile of groundwater TVO concentrations with depth.

The use of field screening results from groundwater samples collected from isolated sections of the borehole during drilling is intended to manage the potential risk of borehole cross-contamination. When the results of the field screening samples (as recorded from the scale printed on the gas detector tubes) at a given borehole decline from the highest recorded value by approximately one order of magnitude, the drilling will be stopped and a permanent steel casing will be grouted in place before proceeding deeper. The objective of this approach is to case off the portion of the borehole with the highest VOC concentrations, prior to advancing the borehole deeper, as a means to manage the risk of potential borehole cross-contamination. An adjacent shallow well will be completed to monitor the cased off portion of the deep borehole.

The collection of groundwater samples from isolated sections of the borehole for field screening will be used to determine the need for and depth of an intermediate casing at each deep borehole location and as one factor in determining the maximum depth of investigation. The decision criteria for setting an intermediate casing or to stop drilling (maximum depth of investigation) are detailed below

- TVO Decision Criterion for Setting Intermediate Casings: In order to manage the risk of potential borehole cross-contamination, the field screening samples will be used to determine the depth at which a permanent steel casing would be grouted into the rock prior to advancing the borehole to greater depths. When the results of the field screening samples decline from the highest recorded value by approximately an order of magnitude (as read directly from the gas tube), the drilling will be stopped and a permanent steel casing will be grouted in place. If the field sample screening results do not decline by approximately an order of magnitude, the drilling will continue in the stepwise fashion described in Section 4.2.3.3.
- TVO Decision Criterion for Drilling Depth: Based on comparison of the Color-Tec results to laboratory results at dry cleaner sites having the same constituents as those reported at the Site, a value of 5 on the gas tube is anticipated to equate to approximately 50 to 100 ppb total chlorinated solvents. Although the groundwater sample collected for analysis will be collected from an isolated section of the borehole following purging

(Discrete Interval Packer Sampling SOP, Appendix A, FSP/QAPP), the entire packer assembly must be lowered through the open borehole that is assumed to have elevated VOC concentrations. Therefore, even if the isolated interval contained no VOCs, one must anticipate that the field screening results will indicate some level of VOCs. The extent to which this cross contamination may occur will be related to the concentration of VOCs in the borehole water.

- Total Depth Criterion: A depth of 450 feet below ground surface is established as the maximum depth of investigation based upon the distance of the Site from the Spring Lake water supply wells (which represent the local groundwater discharge point), the reported depth of these wells of 500 to 600 feet, and the regional dip of the Passaic formation, which will likely influence groundwater flow paths. Based on the projected dip of the formation, a well depth of 450 feet would be projected below the depth of a 600 foot deep water supply well located near Spring Lake. While the need to drill to depths on the order of 450 feet may not be required based upon the field screening samples, establishing a maximum depth based upon the regional conditions is an additional risk management tool.

At each deep boring location, once the borehole has reached total depth based on the collected borehole data and decision criteria as discussed above, the borehole will be temporarily "lined" with a flexible polyurethane liner manufactured by Flexible Liner Underground Technologies Inc. The objective of this approach is to allow for evaluation of the data collected from all of the deep locations, while sealing off the open borehole against potential cross contamination during this decision period. Based on the collected data, decisions will be made regarding permanent monitoring intervals. The permanent monitoring intervals may include a multi-port well installation (i.e., multiple sampling intervals within a single borehole) or construction of a typical, PVC, monitoring well. For example, if there is a long open borehole interval within which the collected data indicates multiple water-bearing zones and varied VOC concentrations, it may be beneficial to complete the location as a multi-port well that will allow for the collection of water quality and water level data. Conversely, if the open interval of the borehole is relatively short, and there is limited variability in VOC concentrations and/or hydraulic conductivity, a single PVC well may be more appropriate. Finally, the collected data may suggest that a given location would serve best as a pumping well for the proposed aquifer test. In this case, the borehole would be completed with a larger diameter casing and open rock interval to facilitate installation of a pump.

The approach described above for the drilling and monitoring well installation will be used to assess the appropriate number and depth of monitoring points. Once the monitoring wells are installed, groundwater samples will be collected in accordance with standard practice and the samples sent for laboratory analysis.

4.2.2.4 Matrix Diffusion Study

Field data collection efforts will also include the collection of rock core for matrix diffusion testing. In fractured sedimentary rock such as the Passaic Formation, matrix diffusion can play a critical role in contaminant transport and should be considered as part of the remedial alternatives evaluation. To address this need, rock core collected at locations MW-100 and MW-107 will be crushed in the field, preserved in methanol, and set aside for laboratory testing of selected VOCs. Additional core samples will also be collected for measurements of matrix porosity.

4.2.2.5 Groundwater-Surface Water Interaction Assessment

In addition to the drilling and monitoring well activities, the field work also includes the installation of staff gauges at selected locations along the Bound Brook. Surface water elevation data collected from these locations will be compared to water levels obtained from monitoring wells and will be used to assess the discharge/recharge relationship between surface water and groundwater.

4.2.2.6 Aquifer Testing

Finally, the field program includes completion of an aquifer test for calculating the aquifer hydrogeologic parameters of transmissivity, storativity, and anisotropy. As discussed more fully in the Preliminary Conceptual Site Model Report (Attachment C), understanding of the areal anisotropy of the underlying Passaic Formation is critical to assessing groundwater flow paths and potential contaminant transport. Completion of an aquifer test, and the monitoring of appropriately completed/located monitoring wells will provide the information needed to more fully understand groundwater flow conditions in the vicinity of the Site.

In summary, the technical approach to the Site Characterization task is to employ the Triad approach, which calls for a dynamic work plan that is based upon established standard operating procedures (SOPs) and decision criteria for the collection and evaluation of field screening data. These data, coupled with the other data collection activities described above, will form the basis for decisions regarding the location of monitoring wells, need for and depth of intermediate casings, depth of investigation, screened intervals, and aquifer properties. Details regarding the data collection methods and the application of decision criteria are discussed in the following sections.

4.2.3 Scope of Work

The following section describes the scope of work to be completed under this Work Plan. Additional details regarding both field and laboratory procedures are presented in the FSP/QAPP in Attachment A. A Health and Safety Plan (HASP) to be followed during completion of the field activities is presented in Attachment B.

Access agreements will be required for the installation of off-Site monitoring wells and the completion of the soil gas and indoor air sampling. Access to the off-Site properties will be pursued prior to implementing the field work. Should reasonable attempts to obtain access to off-site properties fail, assistance may be required from USEPA to secure access.

4.2.3.1 Soil Gas Survey

As noted above, the soil gas survey will be conducted in two stages. The sample locations proposed for Stage 1 and the approach to selecting Stage 2 samples are discussed below and are illustrated on Figure 4-2. A total of approximately 114 exterior soil gas samples are proposed for the Stage 1 investigation. To the extent possible, the soil gas samples will be collected primarily from residential properties at the approximate locations indicated on Figure 4-2; however, field conditions may dictate that the sampling locations be moved because of access restrictions and/or to avoid obstructions. Two samples are proposed to be collected from each of the locations identified, with samples collected from opposite ends of a building. The sampling locations are biased to include a greater number of properties in those areas proximate to the Site, with fewer properties being sampled in areas farther from the Site. Additional properties within the Stage 1 survey area, including commercial properties, may be sampled if suggested by preliminary field results. To the extent practicable, available information on building construction, foundation type, age, heating system type, and cooling system type, along with information on utilities (e.g., to assess potential for preferential pathways) will also be used to select the Stage 1 survey locations.

In general, to the extent possible, soil gas samples will be collected from within approximately 10 feet of a building foundation (near-slab samples), as recommended in the New Jersey Department of Environmental Protection (NJDEP) October 2005 *Vapor Intrusion Guidance* (VIG). Proximity to a building better defines potential impacts to indoor air when using exterior soil gas samples. If the samples cannot be collected from within 10 feet of the building footprint due to site conditions or access, the samples will be collected as close to the building foundation as possible.

4.2.3.1.1 Stage 1 Locations

Locations for the Stage 1 soil gas survey are identified on Figure 4-2 and were selected in areas both down-gradient and side-gradient of the Site, based on currently available hydrogeologic data. The proposed sampling areas may be summarized as follows:

Down Gradient:

- Along the east and west sides of Hancock Street between the railroad and Amboy Avenue.
- Along Lakeview Avenue from the railroad to Church Street.
- Along the south side of Church Street between Kaine Avenue and Hamilton Boulevard.
- Along Hamilton Boulevard between the railroad and Church Street.

Side Gradient:

- Along the south side of Spicer Avenue between Hamilton Boulevard and Garibaldi Avenue.
- Along Camden (north side) and Barone (south side) Avenues between Hamilton Boulevard and Rush Street/2nd Place.

4.2.3.1.2 Stage 2 Locations

Depending on the soil gas results observed during the Stage 1 sampling, additional Stage 2 sampling efforts may be implemented. For example, in the down-gradient area of Hancock Street, Stage 2 sampling may be conducted along the west side of Bergen Street between the railroad and Amboy Avenue. Similarly, the need for sampling beyond the Church Street survey area will be determined based on the initial survey results. In the side-gradient area along Spicer Avenue, additional sampling may be conducted along the south side of Arlington Avenue between Hamilton Boulevard and Garibaldi Avenue. Similarly, depending on the results of soil gas sampling along Camden and Barone Avenues, supplemental soil gas sampling may be conducted along New York Avenue. Each of these potential additional soil vapor sampling locations is identified as a Stage 2 survey area on Figure 4-2, to illustrate potential locations. The actual number and locations of Stage 2 samples, if any, will be determined based on the Stage 1 results.

As previously noted, soil gas samples will be analyzed in the field so that results will be readily available for interpretation and evaluation of both Stage 2 additional sampling efforts and subslab and/or indoor air sampling. To avoid demobilizations and remobilizations and employ the principles of the Triad approach, decisions regarding Stage 2 sample locations, if any, are planned to be made in the field. As data are collected, they will be evaluated, summarized, and transmitted to the USEPA via electronic mail along with recommendations for Stage 2 sample locations, if any, and the desired response time for input from the USEPA so that the field efforts may continue uninterrupted.

The levels of VOCs detected in the Stage 1 soil gas samples will be screened against the soil gas screening levels (SGSLs) provided in the NJDEP October 2005 VIG (the NJDEP SGSL's are more conservative (i.e. lower) than the USEPA SGSL's). These values will be updated to the extent more recent NJDEP and USEPA screening criteria become available. The current SGSLs for site-specific COPCs are as follows:

NJDEP Soil Gas Screening Levels				
Chemical	**Residential**		**Nonresidential**	
	$\mu g/m^3$	**ppbv**	**$\mu g/m^3$**	**ppbv**
Cis-1,2-DCE	1,800	460	2,600	640
PCE	34	5	36	5
TCE	27	5	27	5
1,2,4-Trichlorobenzene	180	25	260	34
Vinyl Chloride	13	5	48	19

The residential and non-residential screening levels for carcinogens represent a 10^{-6} (one in one million) excess lifetime cancer risk or the practical quantitation limit (PQL). Non-cancer screening levels represent a hazard quotient of 1 or the PQL. The non-residential screening levels are based on exposure factors for adult workers. Details on the derivation of the SGSLs are contained in the NJDEP VIG.

Soil gas results that exceed the chemical-specific screening level will be considered indicative of the potential for vapor intrusion into indoor air and will prompt consideration of the expansion of the Stage 1 sampling program to include additional properties not initially sampled and/or an expansion of the program to include the Stage 2 locations, as appropriate, as described above.

4.2.3.1.3 Soil Gas Sampling Methodology

Soil gas samples will be collected from the vadose zone close to the water table, and at least one foot above the capillary fringe. The total depth of sampling will not exceed 20 feet below ground surface (bgs). To the extent possible, the samples will be collected more than 5 feet bgs to minimize the potential for short-circuiting of ambient air. Each of the soil gas samples will be collected into Tedlar bags and analyzed using on-site mobile GC laboratory equipment for the following targeted chlorinated solvents:

- PCE
- TCE
- Cis-1,2-DCE
- 1,2,4-trichlorobenzene
- Vinyl chloride

As described in the Preliminary Conceptual Site Model, this list represents the primary VOCs that were detected in groundwater at the site and may be present down gradient of the site. In addition to the approximately 114 soil gas samples analyzed using on-site mobile GC techniques, a subset of these (10% or 12 samples) will be collected into evacuated 1-L SUMMA canisters, and submitted to a fixed-base laboratory for analysis via USEPA Method TO-15 as a quality assurance check on the on-site GC analysis and to identify a complete list of soil gas constituents. Additions to the list of VOCs subjected to on-site GC analysis may be made if constituents representing more significant risk levels than the selected VOCs are identified from the Method TO-15 analysis.

The soil gas samples will be collected in accordance with the USEPA *Environmental Response Team (ERT) Standard Operating Procedure (SOP) #2042 Soil Gas Sampling, June 1996.* The SOP is attached in FSP/QAPP Appendix B. A description of the sampling procedures is as follows:

- Prior to collecting the soil gas sample, one pilot soil boring will be advanced every 200 feet equidistant across each survey area grid (e.g., three pilot borings will be advanced along Spicer Avenue) using direct-push sampling techniques (e.g., Geoprobe™ or equivalent) to determine soil characteristics and locate the presence of the capillary fringe. The capillary fringe will be identified based on visible soil moisture in the soil boring and/or estimated using the calculated mean rise of the capillary zone (i.e., above the visually estimated zone of saturation) based on field determined soil texture (USDA texture-by-feel method) and default mean soil particle diameter based on the field determined soil texture in accordance with the USEPA June 19, 2003 *User's Guide for Evaluating Vapor Intrusion Into Buildings.* Soils will be returned to the respective boring and borings will be sealed with bentonite to minimize the potential for short circuiting in the collection of the soil vapor sample.

- Soil gas samples will be collected via temporary soil gas sampling points using direct-push sampling techniques. The soil vapor probes will be constructed of a 2-inch diameter steel rod tapered to 1.5 inch at the bottom equipped with a hardened expendable tip. A small diameter length of dedicated inert tubing (e.g., polyethylene) will be inserted through the center of the rod and connected to the drive point (see Figure 4-5). The probe will be driven to approximately 1 foot above the capillary fringe and pulled-up approximately 6 inches to open the probe for soil gas sampling. The upper contact between the probe and the surface soil will be sealed with grout (e.g., bentonite or equivalent) to prevent short circuiting.

- The vapor probe will be purged by drawing soil gas through the tubing into a PID. The soil gas will be extracted from the vapor probe and tubing into the PID until the readings stabilize and then sampled into a Tedlar bag and/or SUMMA canister.

- Soil gas samples will be collected into 1-L Tedlar bags using a Gilian Pump and vacuum box in accordance with the USEPA June 1996 Soil Gas Sampling SOP #2042.

- A subset of soil gas samples will also be collected into a laboratory certified clean 1-Liter SUMMA canister. The samples will be collected at a maximum flow rate of 200 milliliters per minute for 5 minutes and will be equipped with a regulator pre-set by the laboratory to correspond to the 5-minute sampling time.

- A total of two duplicate soil gas samples will be collected, with one duplicate sample collected from each of two separate sample locations for quality assurance purposes.

- Samples will be collected under appropriate chain of custody procedures. The Tedlar bags and SUMMA canisters will be delivered directly to the mobile GC laboratory or shipped overnight to the fixed-base laboratory for analysis via USEPA Method TO-15, respectively.

- The polyethylene sample tubing will be discarded after the collection of each sample and the direct push probe will be withdrawn and decontaminated using soap (Alconox™ or equivalent) and water between sample locations. The borehole will be sealed with bentonite.

4.2.3.2 Sub-slab/Indoor Air Sampling

The indoor air sampling program will be based on the results of the soil gas survey. If the soil gas samples indicate the potential for a complete vapor migration pathway, homes will be selected for crawlspace/sub-slab sampling and, as appropriate based upon consultation with USEPA, indoor air sampling. The levels of VOCs in crawlspace/sub-slab air (if any) and/or indoor air will be compared to chronic, health-based, indoor-air screening levels (IASLs) provided in the NJDEP October 2005 VIG. For the currently identified COPCs, these screening levels are as follows:

Indoor Air Screening Levels				
Chemical	**Residential**		**Nonresidential**	
	μg/m³	**ppbv**	**μg/m³**	**ppbv**
Cis-1,2-DCE	36	9	51	13
PCE	3	0.5	3	0.5
TCE	3	0.5	3	0.5
1,2,4-Trichlorobenzene	6	1	9	2
Vinyl Chloride	1	0.5	1	0.5

The indoor air assessment will also include identifying household/commercial/industrial products containing VOCs, quantifying outdoor background levels of VOC, and quantifying the levels in crawlspace/subslab air, if any.

For those homes identified for indoor air sampling, crawlspace/subslab samples will be collected first for verification according to the *USEPA Draft Standard Operating Procedure for Installation of Sub-Slab Vapor Probes and Sampling Using EPA Method TO-15 to Support Vapor Intrusion Investigations* (USEPA 2002). If the results of the crawlspace/subslab sampling exceed the IASLs, subsequent indoor air characterization sampling will be performed in the basement of the building to provide a conservative estimate of indoor air concentrations, as appropriate. If the building does not have a basement, a sample will be collected from the first floor in a commonly occupied room of the building. The sampling will be performed during two separate sampling events to account for seasonal variability. Each sample will be collected over a 24-hour period. Subslab sampling will be repeated at the time the indoor air samples are collected.

Upon completion of the indoor air sampling activities, levels of VOCs in subslab/crawlspace air and indoor air will be compared to the IASLs. This will provide information on the potential risks of exposure. Indoor air results from each building will also be compared to their respective subslab/crawlspace sampling results to assess whether groundwater and/or soil derived VOCs are contributing to indoor air levels of VOCs. As there are many potential sources of VOCs other than groundwater or soil contamination, a comprehensive review of the outdoor background air data and information from the building surveys and inspection reports will be conducted. This will provide quantitative and qualitative information on these sources contribution of VOCs to indoor air.

A list of additional items and resources that will be considered during the evaluation of data follows:

- National-Scale Air Toxics Assessment (USEPA, 1996), which provides a baseline for ambient conditions in a given geographic area
- NJDEP October 2005 Vapor Intrusion Guidance
- Locations of industrial and commercial sources of VOCs near the sampled buildings (i.g., dry cleaners)
- Groundwater elevations
- ATSDR Minimum Risk Levels for Hazardous Substances

4.2.3.2.1 Sub-slab/Indoor Air Sample Locations

The locations and addresses of the buildings in which sub-slab/indoor air will be sampled will be selected upon completion of the soil gas survey, and will be biased to residential buildings, as applicable. If the soil gas survey and the residential building characterization survey indicate that buildings are in an area of potential for vapor intrusion from groundwater, then 15 soil gas locations with the highest VOC to screening level ratios will be selected for sub-slab/indoor air sampling. If the soil gas survey indicates no evidence of vapor intrusion, then the need for and/or extent of a verification sampling program using sub-slab/indoor air sampling will be developed in consultation with the USEPA and, if implemented would include up to 15 locations, selected on the basis of the collected data (i.e., soil gas and groundwater sampling data).

4.2.3.2.2 Outdoor Air Sampling

In addition to sampling indoor air (subslab/crawlspace or basement/first floor), outdoor (i.e., background) air samples will be collected in the vicinity of the indoor air sampling locations. These samples will be used to assess the ambient outdoor air concentrations of VOCs that may impact indoor air. Outdoor air samples will be collected over the same 24-hour period as the indoor air samples.

4.2.3.2.3 Air Sampling Methodology

Whole air samples will be collected in evacuated SUMMA canisters, and analyzed in accordance with USEPA 1999. The FSP/QAPP provides the details of sampling procedures. The samples will be analyzed using USEPA Method TO-15 and will obtain the detection limits needed to compare concentrations detected in air to the IASLs.

Prior to sampling, occupants of the buildings to be sampled will be given a set of instructions and survey (See SOPs in FSP/QAPP Appendix B) to follow starting at least 48 hours prior to the sampling event. During sampling, the occupants and sampling personnel will complete a building survey that establishes an inventory of products such as cleaners, solvents, etc. that were present in the building at the time of sampling. If permitted, a preliminary walk-around inspection will also be performed to identify potential sources of VOCs. Products that contain VOCs include, but are not limited to:

- Paints and paint thinners
- Cleaning products
- Hobby supplies
- Glues and furniture compounds
- Dry cleaned clothes
- Insecticides/Pesticides
- Office supplies
- Pressed wood furniture
- New carpet

4.2.3.3 Drilling and Borehole Testing.

Drilling and borehole testing will be conducted at the ten (10) locations illustrated in Figure 4-3, with adjustments to these locations made as applicable based upon the soil gas survey results obtained as described above in Section 4.2.3.1 and/or adjustments made related to access issues. Adjustments to the boring locations based on the soil gas results would be made to locate the well in an area exhibiting elevated gas readings. If the soil gas readings are generally consistent (i.e., no areas of high concentration) and/or below detection levels, the borings will be installed within the generally proposed area as dictated by access conditions. In addition to these ten locations, and provided access can be obtained to the wellhead, borehole testing will also be completed in the former Site production well located near MW-3.

A licensed NJ well driller will conduct drilling activities and required well permits will be obtained prior to drilling. Drilling methods will include the use of wet rotary drilling for coring and, to the extent practical, air rotary methods for general drilling. Air rotary methods are preferred for efficiency. However, the use of air rotary may not be practical in residential areas due to space constraints, the potential for generation of dust in the unsaturated or drier portions of the borehole, or the potential generation of excessive amounts of water within a highly productive bedrock interval. Under these conditions, substitute methods such as hollow stem augers for overburden drilling and wet rotary methods for bedrock drilling may be employed. Water used during the drilling activities will be obtained from a potable source, and cuttings and water generated during drilling will be containerized at the wellhead for subsequent transportation back to a staging area to be located at a designated area on the Site.

Drilling equipment, including drill rods, packer testing assemblies, and sampling pumps will be decontaminated (Decontamination SOP, FSP/QAPP Appendix A) between drilling locations at a designated area on the Site. Further, upon completion of the work at each location, the surrounding area will be broom cleaned, and equipment, temporary drums, and tanks will be removed from the area.

The shallow bedrock wells at each location will be completed by advancing a borehole to the top of rock and setting a temporary casing. A six (6) inch diameter borehole will then be advanced thirty (30) to fifty (50) feet into rock until the first evidence of water is observed during the drilling process or a maximum of 50 feet below the top of rock. At locations MW-101, 102, 103, 104, 106, and 108, a borehole sample will then be collected by lowering the packer sampling assembly into the borehole and collecting a sample for field analysis (ColorTec SOP, FSP/QAPP Appendix A)). The results of the field screening sample will be used as a preliminary indication of VOC concentrations and for later correlation with water quality samples collected from the monitoring well. The lower 30 to 50 feet of the open borehole interval will then be packer tested in ten foot intervals for hydraulic conductivity (Packer Pressure Testing SOP, FSP/QAPP Appendix A). Information for the shallow wells to be completed at locations 107 and 109 will be obtained from the adjacent deep bedrock borehole and the testing described above will not be completed in the shallow borehole at these two locations.

The ten foot interval within the lower 30 to 50 feet of the borehole exhibiting the highest hydraulic conductivity will be selected for installation of a monitoring well. If the selected interval is above the bottom of the borehole, the borehole will be backfilled to the selected depth with cement/bentonite grout and/or bentonite pellets. The well will then be completed as a two-inch diameter PVC monitoring well equipped with a ten-foot screen in accordance with Well Installation SOP (FSP/QAPP Appendix A).

At deep bedrock well locations MW-100 and MW-107 a temporary casing will be set into rock and advancing the borehole will begin with the collection of NQ size rock core. The core will be retrieved from the borehole, logged, and representative portions of the core will be collected for potential matrix diffusion testing (Rock Core SOP, FSP/QAPP Appendix A). The coring will continue in thirty (30) to fifty (50) foot intervals following which a packer sampling assembly will be lowered into the borehole for collection of a field screening sample. The decision to advance the borehole between 30 and 50 feet will depend on the observed drilling conditions. For example, if the collected core indicates a number of potential water-bearing fractures through the first 30 feet of drilling, coring will stop and a sample will be collected. Conversely, if the rock core suggests that the potential for water-bearing fractures is limited, the boring would be continued an additional 20 feet before attempting to collect a field screening sample. The drilling will continue in this step-wise fashion, drilling and sampling, drilling and sampling, until the field screening sample results change by an approximate order of magnitude as discussed below.

Given the existing water quality data, it is anticipated that locations MW-100 and MW-107 will encounter elevated levels of VOCs at depths of less than approximately 75 feet below ground surface. In order to manage the risk of potential borehole cross-contamination, the field screening samples will be used to determine the depth at which a permanent steel casing would be grouted into the rock prior to advancing the borehole to greater depths. When the results of the field screening samples decline from the highest recorded value by approximately an order of magnitude (as read directly from the gas tube), the drilling will be stopped and a permanent steel casing will be grouted in place, after packer testing and geophysical logging as discussed further below. If the field sample screening results do not decline by approximately an order of magnitude, the drilling will continue in the stepwise fashion described above. As noted, the objective of this approach is to case off the portion of the borehole with the highest VOC concentrations, prior to advancing the borehole deeper, as a means to manage the risk of potential borehole cross-contamination.

Upon reaching a decision to set a permanent casing, the borehole will be packer tested for hydraulic conductivity (Packer Pressure Testing SOP, FSP/QAPP Appendix A), geophysically logged (Borehole Geophysical Logging SOP, FSP/QAPP Appendix A) and then reamed to 10" in diameter. A 6" diameter steel casing will then be tremie grouted into place.

After allowing sufficient time for the grout to set up, drilling, using an NQ core barrel, will continue through the 6" casing, again proceeding in the stepwise fashion described above. The drilling will continue until the field screening samples indicate a value of less than 5 on the gas tube or a maximum depth of 450 feet. Upon reaching one of these criteria, the borehole will be packer tested for hydraulic conductivity, geophysically logged, and reamed to a nominal 6" in diameter. The open borehole will then be temporarily sealed with a liner manufactured by Flexible Liner Underground Technologies (Water FLUTe Installation SOP, FSP/QAPP Appendix A) until the remaining deep boring locations have been completed, the collected data can be evaluated, and decisions made regarding the final well installation specifications.

At deep boring location 109 and the deep boring at location 101 or 102, the drilling operations will proceed as discussed above, with the exception that rock core will not be collected at location 101 or 102 and rock coring at location 109 will be completed for statigraphic correlation only. Rock core samples will not be collected for matrix diffusion testing at this location.

The procedure of drilling in 30 to 50 foot increments followed by collection and analysis of a field screening sample, as described above, will also be followed at these locations. However, the potential exists that the field screening may indicate generally low-level VOC concentrations in the upper portions of the bedrock, followed by increasingly higher concentrations with depth, followed again by declining concentrations. These conditions may exist, specifically at location 109, if the plume is being pulled deeper into the formation from regional water supply pumping and recharge to the aquifer (infiltrating rainfall) forms a layer of uncontaminated water over the top of the plume at depth.

Under this scenario, the drilling will continue through the higher VOC concentrations until they decline by approximately one order of magnitude as discussed above. If the depth at which drilling is stopped is less than approximately 75 feet below the top of rock, the borehole will be packer tested, geophysically logged, reamed to 10" in diameter and a permanent steel casing will be grouted into place as described above. Drilling would then proceed through this 6" steel casing, again as described above.

However, if the depth at which drilling is stopped is greater than approximately 75 feet, the borehole will be packer tested, geophysically logged, reamed to 6" in diameter and a temporary liner will be installed (Water FLUTe Installation SOP, FSP/QAPP Appendix A). Drilling will continue by moving to an adjacent location, and setting a permanent 6" steel casing to the pre-determined depth (i.e., the depth at which drilling was stopped in the adjacent borehole based upon the field screening samples). Drilling will then continue through this casing until the field screening samples indicate a value of less than 5 on the gas tube or a maximum depth of 450 feet, consistent with the procedures described above.

The above procedure will be followed to maintain flexibility in the selection of permanent monitoring intervals in the boreholes completed during the field investigation.

Old Production Well

The old production well on the CDE property likely represents a long open rock interval within which testing can be done to further assess the bedrock properties. Provided access to the wellhead can be attained, the open rock portion of the well will be packer tested in ten foot intervals and geophysically logged. Optionally, three to four intervals may also be selected for collection of a field screening sample.

Accoustical Logging

If the rock core and packer test results indicate that the groundwater flow system beneath the Site represents a discrete fracture flow system, acoustical logging will be conducted in the lined deep boreholes completed during this investigation and in the old production well. The acoustical logging, if used, will be conducted by Mid-Atlantic Geosciences, LLC and is used to identify fractures (both open and closed) intersecting the open borehole and provide quantitative strike and dip values for the identified features. Evaluation of these data provides an understanding of the predominant and subordinate fracture patterns that dictate groundwater flow.

Acoustical logging will not be considered if the coring and packer testing does not suggest that groundwater flow is controlled by a discrete fracture flow system. Under these conditions, the fractures are sufficiently interconnected such that the strike and dip of individual fractures does not dominate groundwater flow patterns.

4.2.3.4 Monitoring Well Installation

This task includes the selection and completion of permanent monitoring intervals/wells within the deep bedrock boreholes that were completed with temporary liners as described above. The data collected above will be evaluated for intervals of elevated hydraulic conductivity, vertical hydraulic conductivity profile, preliminary head measurements obtained while packer testing, field screening sample results, length of the open borehole, strike and dip information, location with respect to the Site and correlation of data from location to location, to select permanent monitoring intervals.

Alternatives for final completion include a standard PVC monitoring well, an open rock monitoring well, or a multi-port monitoring well with isolated sampling ports at multiple depths within a single borehole. The selection of the appropriate completion method will be determined based upon the above criteria, and the selected method and intervals will be provided in a technical memorandum to USEPA for review and agreement prior to completion.

Installation of the permanent monitoring points will proceed upon agreement with USEPA. If one or more of the locations are to be completed as a multi-port installation, the system to be employed will be the Water FLUTe system manufactured by Flexible Liner Underground Technologies (Water FLUTe Installation SOP, FSP/QAPP Appendix A). Specifications, including borehole diameter, total depth and the number and length of the selected sampling ports will be provided to FLUTe, and the Water FLUTe will be constructed specifically for the borehole of interest. The completed Water FLUTe will be shipped to the Site on a reel ready for installation. Delivery time is typically on the order of 45 days from receipt of the order specifications.

Installation of the permanent monitoring points, regardless of the selected construction method, will begin with the removal of the blank liner installed at the completion of drilling. The blank liner will be discarded, and the well will be constructed in accordance with the appropriate SOP. Following construction, each location will be developed to promote hydraulic communication with the surrounding water-bearing zone, and a NJ licensed Surveyor will provide vertical and horizontal control.

4.2.3.5 Investigate Surface Water/Groundwater Relationship

This task provides for the installation of four staff gauge locations at selected intervals along the Bound Brook. The most upstream location will be on or near the Site, while the most downstream location will be near monitoring well location 109. The remaining two locations will be intermediate between these two. A permanent measuring point will be established, and the location will be surveyed for vertical and horizontal control. Measurements of the surface water level will be obtained from these locations and compared to water level data collected from the monitoring wells.

4.2.3.6 Water Level Monitoring

Two to four rounds of water levels will be collected from the available monitoring wells and staff gauges in the study area. The water level rounds will be timed to coincide with seasonal wet and dry periods, and will be used to assess groundwater flow direction, vertical and horizontal gradients, and interaction between bedrock groundwater and surface water.

4.2.3.7 Water Quality Sampling

Following completion of the monitoring wells discussed above, and after allowing a minimum of two weeks for stabilization following installation of the wells, groundwater samples will be collected from the new wells installed as described above and from the existing on-site monitoring wells (MW-01 through MW-12). Samples will be collected in accordance with the low flow methodology (Groundwater Sampling SOP, FSP/QAPP Appendix A) or, if multi-port Water FLUTes are installed, in accordance with the sampling protocols for the Water FLUTe system (Groundwater Sampling SOP, FSP/QAPP Appendix A).

The collected samples will be stored on ice and transported to Severn Trent Laboratories (STL) under chain of custody. Sample analysis will include Target Analyte List (TAL) metals, including cyanide, Target Compound List (TCL) organics, plus 30 tentatively identified compounds (TICs), and selected bio-degradation parameters as provided for in the QAPP. In addition, samples collected from MW-8, MW-11 and the new well at location A will be analyzed for dioxin/furan. CLP equivalent data reports and electronic deliverables will be provided.

A second round of samples will be collected from the newly installed wells approximately two to three months after the first round. The analytical parameters will be determined based upon the results of the first round and recommended in an electronic mail to USEPA prior to sample collection.

4.2.3.8 Aquifer Testing

The SOW indicates that a determination of need for an aquifer test will be made in the future. However, based on the current Preliminary Conceptual Site Model and an overall understanding of the site hydrogeology, an aquifer test is anticipated as a part of the work plan. A 72-hour aquifer test is planned to collect Site specific hydrogeologic data. The designated pumping well and wells to be monitored during the test will be selected following review of data collected during the site characterization investigation and provided to USEPA for approval in a Technical Memorandum prior to conducting the work. While the details of the aquifer test related to the pumping well and monitoring points will be defined in the Technical Memorandum described above, the test will be conducted in accordance with the following procedures.

- A six-hour step drawdown test will be conducted at the selected pumping well to assess the long-term yield and select a pumping rate for the aquifer test

- Data loggers will be installed at selected well locations and antecedent data will be collected for a minimum of 48 hours prior to the aquifer test to evaluate potential influences related to barometric efficiency, external pumping, etc.

- A round of manual water level measurements will be collected prior to starting the aquifer test and the data loggers will be reset to collect data on a logarithmic time scale.

- The aquifer test will be conducted at a constant pumping rate and equipment to power the pump, handle the discharge water, etc., will be in place prior to the test. The discharge water will either be temporarily contained on-Site or appropriate arrangements, permits, etc. will be obtained for discharge.

- Samples of the discharge water will be collected shortly after starting the test and again just before completion of the test. Analytical parameters will consist of TAL metals, cyanide, and TCL organics.

- Manual water level measurements will be collected during the test to supplement the data obtained from the data loggers. Manual measurements will be more frequent during the early time portions of the test and collected at longer intervals as the test nears completion.

- Barometric pressure and precipitation data during the antecedent data collection and aquifer test will be obtained from the nearest commercial source.

- Recovery data will be collected from only those wells monitored by data loggers for a period of 72 hours.

- The collected data will be corrected, as needed, for barometric efficiency, observed trends, etc. and analyzed in accordance with accepted methods applicable to semi-confined aquifers.

4.2.3.9 Site Characterization Summary Report

Following receipt, analysis, validation, and evaluation of the collected data, a Site Characterization Summary Report will be prepared that summarizes the work completed to date and the resulting conclusions. The Report will describe the site hydrogeology, groundwater flow, contaminant transport, nature of contamination (e.g., presence or absence of NAPL), affected media, and extent of the plume and will be prepared to assist in the risk assessment work and development and screening of remedial alternatives and ARARs evaluation. The Report will include narrative, tables, and maps, as appropriate to illustrate the Site Characterization information

4.3 IDENTIFICATION OF CANDIDATE TECHNOLOGIES (SOW TASK IV)

4.3.1 Purpose

The purpose of this task is to identify and screen potential technologies that may be applicable to groundwater at the Site. The goal will be to develop a list of candidate technologies that are applicable to Site-specific conditions and are technically implementable. The identified technologies will then serve as a basis for evaluating the need for treatability studies or additional data, if any, and as a precursor to the Feasibility Study to follow.

4.3.2 Approach

The list of candidate technologies will be developed concurrently with the OU 3 Site Characterization. Specifically, the memorandum presenting the candidate technologies will be prepared following data collection and validation, but prior to completion of the RI. With this approach, the data generated and Site-specific information gathered from the OU 3 Site Characterization can be used to identify, develop, and screen the technologies. Additionally, information produced from previous investigations will be used as appropriate. Both conventional and innovative technologies will be considered based on Site characteristics and implementability as the primary screening criteria.

4.3.3 Scope of Work

A list of potentially feasible remedial technologies will be created following a review of the Site-specific information and data generated from the OU 3 Site Characterization and previous investigations. Technologies will be tabulated and initially screened for applicability to the Site characteristics. Following the initial screening the candidate technologies will be screened on the basis of technical implementability. Geologic, hydrogeologic, and contaminant characteristics will be the predominant factors used to assess technical implementability. Technology screening will also be performed on the basis of expected effectiveness and cost. Cost at this stage in the process will be used to differentiate between otherwise equivalent technologies, that is, if two technologies are functionally equivalent, but one is much more costly, then the costly technology may be eliminated if it does not afford any other benefits that would be considered in the more detailed evaluations that will follow.

After the technologies have been identified and screened, a memorandum regarding the candidate technologies will be submitted to the USEPA. The Identification of Candidate Technologies Memorandum will contain a narrative summary of the Site characteristics used in the process, tabulation of the technology screening process, a final list of the candidate technologies, and any appropriate attachments, including data and maps that may be used in the process. If this technology screening step identifies data needs for further technology evaluation during the Feasibility Study, these will also be documented in the memorandum.

4.4 TREATABILITY STUDIES (SOW TASK V)

4.4.1 Purpose

Treatability studies will be conducted if, in evaluation of the Site Characterization data, potentially applicable technologies and potentially applicable remedial alternatives indicate that such studies will be of value. The purpose of the studies will be to provide data that can be used to assess technologies/alternatives to the extent that such data are needed in the Feasibility Study (FS) to adequately evaluate the alternatives.

4.4.2 Approach

This treatability studies will be approached with one preliminary step and subsequent steps, as appropriate, as follows:

1) Review and Evaluation of Site Characterization Data, a Literature Survey and Determination of the Need for Treatability Testing
2) Treatability Testing Statement of Work
3) Treatability Testing Work Plan (including QAPP and HASP)
4) Treatability Study Evaluation Report

The results of the preliminary step, review and evaluation of Site Characterization data along with a literature survey, will indicate whether the succeeding steps are necessary.

The approach to the initial evaluation will be to identify whether treatability studies would be necessary for remedy selection. If, for example, the effectiveness of a potentially applicable alternative could only be evaluated if treatability study data were collected, then such studies would be considered. Additionally, even if the evaluation of Site Characterization data indicates that the information necessary for remedy selection is available without treatability studies, such studies may be necessary to select among process options. In the latter instance, treatability studies would most likely be considered as part of pre-design efforts following remedy selection assuming that process options do not effect the remedy selection process.

4.4.3 Scope of Work

4.4.3.1 Review and Evaluation of Site Characterization Data and Literature

The data generated from the OU 3 Site Characterization will be examined and assessed for sufficiency to develop and evaluate remedial alternatives. In addition, a literature survey will be conducted to gather information on such factors as performance, relative costs, applicability, removal efficiencies, operation and maintenance (O&M) requirements, and implementability of candidate technologies. If the collective Site Characterization and literature survey data are sufficient to perform a detailed analysis of remedial alternatives, then a submittal will be made to the USEPA that will document why a treatability study is considered unnecessary. The form of this submittal may vary depending on the analyses of available information and likely technologies/alternatives. The submittal may be a memorandum or report with appropriate supporting information (e.g., tabulations of data needs vs. data availability). Then, pending USEPA's approval of the submittal, treatability studies will not be performed and the subsequent steps described herein will not be necessary.

If the data generated from the OU 3 Site Characterization in conjunction with the literature survey regarding likely technologies/alternatives is not considered sufficient to complete the FS, then treatability testing will be conducted and a Treatability Testing Statement of Work (TTSOW) will be submitted to the USEPA.

4.4.3.2 Treatability Testing Statement of Work

If treatability studies are necessary for evaluation of technologies or alternatives, then a Treatability Testing Statement of Work will be submitted to the USEPA. The submittal will identify the technologies/alternatives for which the studies are to be performed, basis for additional data needs, and the scope of the treatability studies. The scope of the studies will include the type of data to be collected and explanations as to how the studies will generate data. In addition, the TTSOW will recommend the preferred nature of the studies (e.g., bench scale, pilot scale). Decisions regarding the content and form of treatability studies will be made, in conjunction with USEPA, as early in the RI/FS process as practicable to minimize the overall project schedule and to take advantage of potential work efficiencies with ongoing field activities.

4.4.3.3 Treatability Testing Work Plan.

If treatability testing is required, whether it would be bench-scale testing or pilot testing, a Treatability Testing Work Plan will be prepared and submitted to the USEPA, following submittal of the TTSOW. The Treatability Testing Work Plan will consist of the following, as applicable to the particular type of study:

- Summary of Relevant Site Characteristics/Data Supporting the Decision Regarding Treatability Studies
- Description of Technologies/Alternatives Addressed by the Studies
- Test Objectives
- Equipment and Materials
- Laboratory Testing Procedures
- Treatability Test Plan Matrix and Parameters to Measure
- Pilot Plant Installation and Startup
- Pilot Plant O & M Procedures
- Parameters to be Tested
- Sampling Plan
- Analytical Methods
- Data Management
- Data Analysis and Interpretation
- Health and Safety
- Residuals Management
- Permitting

4.4.3.4 Treatability Testing QAPP and HASP

If the Quality Assurance Project Plan (QAPP) and the Health and Safety Plan (HASP) prepared for this RI/FS Work Plan do not address all of the items necessary for implementation of treatability studies, then either a separate QAPP and HASP, or amendments to the RI/FS QAPP and HASP, will be prepared and submitted to USEPA. The decision as to the applicable approach, i.e., a new or amended QAPP and HASP, will be based on how closely the RI/FS QAPP and HASP address the various components of the treatability studies. For instance, if only minor revisions to the HASP are necessary, but major revisions to the QAPP are necessary, then a HASP amendment and a new QAPP could be submitted.

4.4.3.5 Treatability Study Evaluation Report

After completion of the treatability studies, a Treatability Study Evaluation Report will be submitted to USEPA. The report will describe the testing that was performed and the test results, with comparison to any predicted results. An explanation will be provided describing how the results will assist in evaluation of the remedial alternatives, with emphasis on how the treatability studies can be used to assess effectiveness, implementability, and cost of the studied technologies. The applicability of the data to full-scale use of a technology will also be assessed, and as appropriate, sensitivity analyses will be used to evaluate scale up. Attached to the report will be a summary of the data, along with lab and field reports, as applicable, describing the testing techniques and procedures.

4.5 BASELINE RISK ASSESSMENT (SOW TASK VI)

4.5.1 Purpose

The purpose of the Baseline Human Health Risk Assessment (BHHRA) for OU 3 is to assess the likelihood that constituents from the Site in groundwater could pose potential adverse effects to human health and the environment, in accordance with the provisions of the Settlement Agreement.

4.5.2 Approach

The approach to the BHHRA is basically embodied in USEPA guidance. Overall, the primary guidance for completion of the human health risk assessment is USEPA's "Interim Final Risk Assessment Guidance for Superfund (RAGS)," Volume 1, Human Health Evaluation Manual (Part A)," (December 1989) (EPA/540/1-89/002). Other guidance will also be used as cited herein, as appropriate.

4.5.3 Scope of Work

This section includes a description of the following: (1) a Memorandum on Exposure Scenarios and Assumptions; (2) a Pathways Analysis Report; and (3) compilation of these submittals into the final Baseline Human Health Risk Assessment Report, as discussed in Section 4.5.3.3.

4.5.3.1 Memorandum on Exposure Scenarios and Assumptions

A Memorandum on Exposure Scenarios and Assumptions will be prepared that will describe the exposure scenarios and assumptions to be evaluated in the BHHRA, consistent with current and potential future land use. This memorandum will include a description of the Conceptual Site Model used to develop the exposure scenarios and assumptions inclusive of a completed RAGS Part D Table 1, or equivalent, which will describe the pathways selected for evaluation in the BHHRA, and rationale for their selection. This memorandum will include a completed RAGS Part D Table 4, or equivalent, describing exposure pathway parameters and appropriate references.

The exposure assumptions will include exposure parameters for both reasonable maximum and central tendency intake calculations.

4.5.3.2 Pathway Analysis Report

The Pathway Analysis Report (PAR) will be prepared in accordance with OSWER Directive 9285.7.01D-1 (latest version) and other applicable risk assessment guidance, to present the information that describes how potential risks at the Site will be assessed. The individual components of the PAR are described in the sections that follow.

4.5.3.2.1 Chemicals of Potential Concern (COPCs)

A list of constituents present in groundwater and proposed chemicals of potential concern (COPCs) will be generated based on the information contained within the Site Characterization Summary Report. The presentation of COPCs will include a discussion of data usability and the Data Usability Worksheet from RAGS Part D Appendix C. The data usability will identify data points not suitable for inclusion in the BHHRA, if any.

In identifying COPCs, background concentrations may be an issue, as previously discussed. The approach to this aspect of the BHHRA will be to first evaluate the data and determine if any constituents are problematic with respect to a background consideration. If background is an issue for certain analytes, a further evaluation of background conditions will be conducted to assess whether there is a need for additional data and if so, what types of data.

4.5.3.2.2 Selection of COPCs

COPCs will be selected based on a comparison of representative concentrations of each of the detected hazardous substances to residential Preliminary Remediation Goals (PRGs) established by the USEPA Region 9. The Report will also include the information required for Standard RAGS Part D Table 2: Occurrence, Distribution and Selection of COPCs. Standard Table 2 includes the information on the selection of COPCs including chemical name, CAS no., minimum and maximum detected concentrations and detection limits, background concentrations, screening levels, frequency of detection, potential ARAR/TBC source, and rationale for inclusion or exclusion as a COPC. As a part of this evaluation, chemical concentrations in groundwater for potable use will be compared with MCLs to assess the need for more detailed evaluation (e.g., quantitative risk evaluation).

4.5.3.2.3 Media Specific Exposure Point Concentrations

For each COPC selected for evaluation, an exposure point concentration on a medium-specific basis will be calculated as the minimum of (1) the distribution-specific (i.e., normal or lognormal) 95% upper confidence limit on the mean and (2) the maximum concentration. The exposure point concentration (EPC) will be presented consistent with Table 3 from RAGS Part D. This information will include the COPCs, arithmetic mean, 95th upper confidence level of normal data, maximum concentrations and EPC. The supporting information for this table will discuss how the samples will be grouped and hot spots addressed, how temporal data such as different groundwater sampling events will be combined, and how upgradient and cross gradient samples will be addressed. The supporting information will also describe the statistical basis for the EPC calculations including the determination of the data distribution.

4.5.3.2.4 Toxicological Information

This portion of the PAR will provide toxicological data for the COPCs including cancer slope factors, reference doses, reference concentrations, weight of evidence, and adjusted dermal toxicological factors, if appropriate. The toxicological information will be submitted in RAGS Part D Standard Format Tables 5 and 6. If COPCs are identified for which USEPA's Integrated Risk Information System values are not available, then this list will be provided to the USEPA, as soon as practicable, so that the USEPA may pursue obtaining such data from the National Center for Environmental Assessment. The following hierarchy will be used to identify toxicity factors:

- Integrated Risk Information System (IRIS)
- Health Effects Assessment Summary Tables (1997)
- National Center for Environmental Assessment (NCEA)

4.5.3.3 Baseline Human Health Risk Assessment

The BHHRA will be prepared in accordance with the SOW, RI/FS Work Plan and applicable EPA guidance,: "Interim Final Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual (Part A)," (RAGS, EPA-540-1-89-002, OSWER Directive 9285.7-01A, December 1989); "Interim Final Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual (Part D Standardized Planning, Reporting, and Review of Superfund Risk Assessments)," (RAGS, EPA-540-R-97-033, OSWER Directive 9285.7-01D, January 1998); or subsequently issued guidance.

Data will be presented in tables consistent with RAGS, Part D (e.g., Tables 7 through 10). The BHHRA will be consistent with the previously completed work (e.g., PAR, exposure scenarios and assumptions) submitted to the USEPA. The BHHRA will be submitted as a draft to the USEPA for review, in accordance with the terms of the Settlement Agreement. In general, the BHRRA is anticipated to include the following sections:

Data Evaluation will present a compilation of COPCs and associated concentrations using currently available media-specific analytical data generated during the RI. The data evaluation will include elements of the Pathway Analysis Report described above. This section will also evaluate the usability of the data including data qualifiers and elevated detection limits in accordance with EPA guidance (EPA 1990a; EPA 1998a) and the data usability worksheet in RAGS Part D.

Exposure Assessment will characterize the physical setting, both now and for the future, and identify potentially exposed populations. This section will describe the general physical characteristics of the Site and the population at the Site and of the adjacent land including climate, vegetation, groundwater hydrology and the presence and location of surface water, as applicable based on the Site Characterization. Populations will be described with respect to those characteristics that affect exposure. The presence of any sensitive sub-populations will be evaluated.

The Conceptual Site Model showing the sources of chemicals, migration pathways, transport mechanisms, receptors and types of exposure will be presented. The Conceptual Site Model will build on the Preliminary Conceptual Site Model currently developed for the Site (see Attachment C). Reasonable maximum and central tendency assumptions will be developed for each receptor and each pathway. A discussion of the exposure assumptions and the statistical basis for the selection of the assumptions will be included.

The Exposure Assessment parameters and data will include the elements required for Tables 1, 3 and 4 in RAGS Part D.

Toxicity Assessment will present the toxicity factors (slope factors and reference doses) used to calculate risk. The Toxicity Assessment will explain the basis for the toxicity factors, the weight-of-evidence for potential carcinogens, uncertainty factors and target organs for non-carcinogens consistent with the Pathways Analysis Report.

Reasonable effort will be made to identify toxicity factors or suitable surrogates for each COPC. COPCs without toxicity factors will be included in the Uncertainty Analysis.

Risk Characterization will present the results of the risk characterization including cumulative cancer risk and non-cancer hazard quotients estimated for the COPCs and exposure pathways. The results will be presented consistent with RAGS Part D Standard Tables 7 through 10. For hazard indices greater than 1, a discussion of the target organ and the appropriateness of adding hazard quotients will be discussed.

This section will explain the process used to estimate risk, and the context of the results in relation to EPA's target risk ranges.

Uncertainty Analysis will discuss the level of confidence that can be placed on the results of the risk assessment including the adequacy of the sampling and resulting data, the omission of chemicals from the quantitative risk assessment, if any, uncertainties in the exposure assumptions, the calculation of exposure concentrations, the sensitivity of fate and transport models, and uncertainty around toxicity factors, and risk characterization.

After review and approval by the USEPA, the BHHRA will be incorporated into the RI report.

4.6 REMEDIAL INVESTIGATION REPORT (SOW TASK VII)

4.6.1 Purpose

The purpose of the RI report will be to consolidate the findings from the Site Characterization work and the BHHRA to form the basis for the Feasibility Study that follows. The RI report will present the information from these efforts in a single document.

4.6.2 Approach

The RI report will be prepared in accordance with the approved RI/FS Work Plan, the "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (USEPA, 1988), and other relevant guidance. In addition, the input received from the USEPA during the presentation (see Section 4.7) will be reflected in the RI report. The approach to the RI report, in general, will be to present the information in a form consistent with regulatory guidance and so that it is conducive for use in the development of the FS.

4.6.3 Scope of Work

As noted above, the RI report will be prepared in accordance with relevant guidance and the approved RI/FS Work Plan. The report will include sections on Site description and history; investigation strategy, implementation, and methods; physical characteristics of the study area; evaluation of data collected before and during the Site Characterization; the nature and extent of contamination, Site Characterization conclusions and the BHHRA.

As a part of the RI, a number of specific elements will be prepared that are summarized below. The actual form and content of the information that will be presented will vary based on the actual outcome of the Site Characterization work.

- Tables will be prepared that will provide a summary of data collected including well information (e.g., elevations, construction details, etc.), analytical results, field screening data, field hydrogeologic data (e.g., packer test results), etc.

- Maps and figures will be prepared to illustrate well locations, sampling locations, groundwater contours/flow direction, plume delineation (e.g., isoconcentration maps or similar depictions), stratigraphy (e.g., hydrogeologic sections), etc.

- Various items will be appended to the RI report including boring and well construction logs, laboratory reports, field data sheets (e.g., sampling, packer testing, geophysical logs, etc.), chain of custody records, data validation reports, etc.

In addition to the above, the BHHRA will be presented as a part of the RI as enumerated in Section 4.5 along with the results of fate and transport modeling, if performed.

The RI report will be initially prepared as a draft and submitted to the USEPA for review. Following USEPA review, a final OU 3 RI report will be prepared and submitted to USEPA.

4.7 DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES (SOW TASK VIII)

4.7.1 Purpose

The purpose of the development and screening of remedial alternatives is to evaluate a range of remedial alternatives for protection of human health and the environment, which are consistent with the Site Characterization and BHHRA results.

4.7.2 Approach

The remedial alternatives will be developed and screened based on the candidate technologies previously identified in Section 4.3, Identification of Candidate Technologies, the Site Characterization data, and the results of treatability studies, if any. With this approach, the appropriate technologies and Site-specific information gathered from the OU 3 Site Characterization and treatability studies can be used to identify, develop, and screen appropriate remedial alternatives. To the extent practicable, the development and screening process will be performed concurrent with the RI Site Characterization work.

4.7.3 Scope of Work

The scope of work required for this task will consist of the following two major activities:

- Development and Screening of Remedial Alternatives
- Detailed Analysis of Remedial Alternatives

Each of these major activities and associated subtasks are set forth in more detail below.

4.7.3.1 Development and Screening of Remedial Alternatives.

4.7.3.1.1 Summary of Key Findings of Site Characterization

The first step in the process will be to summarize the key findings of the site characterization, upon which remedy selection is contingent, which will include the following:

- Assessment of Distribution/Nature and Extent of Contamination: This will be presented in a form that suits the findings from the analysis of the data collected in the Site Characterization. The Contaminants of Potential Concern (COPCs) will be identified along with maps, cross-sections, and figures as appropriate to present the nature and extent of contamination.

- Baseline Risk Assessment: This discussion will include a summary of the BHHRA. Items that will be presented include COPCs, action levels/risk levels, and the Conceptual Site Model, which will be used to identify exposure scenarios (exposure points, pathways, and receptors). This information will be presented in tables, diagrams, charts, and maps, as appropriate to the actual information generated from the risk assessment work. Additionally, should there be any significant data limitations, they will be presented along with associated implications.

4.7.3.1.2 General Response Actions

General actions will be developed defining containment, treatment, removal, or other actions, including institutional controls, singly or in combination, which could satisfy the remedial action objectives.

4.7.3.1.3 Areas and Volumes of Media

Areas and volumes of media to which general response actions may apply will be identified. Requirements for protectiveness as identified in the remedial action objectives, and physical and chemical characteristics will be taken into consideration in developing these data (e.g., volume per se may be less appropriate to groundwater than rate).

4.7.3.1.4 Assembly of Alternatives

Selected representative technologies will be assembled into alternatives that will represent a range of treatment and containment combinations addressing OU 3 as a whole. A summary of the assembled alternatives and their related action-specific Applicable, Relevant and Appropriate Requirements (ARARs) will be prepared for inclusion in a Remedial Alternatives Screening Technical Memorandum.

4.7.3.1.5 Refinement of Alternatives

The remedial alternatives will be refined to identify contaminant mass addressed and to further define the alternative (e.g., sequence of critical unit operations, process flow diagrams, etc., as applicable). Sufficient information will be developed for an adequate comparison of alternatives retained for evaluation. Preliminary Remediation Goals (PRGs) developed from the risk assessment information will also be used to refine the understanding of the alternatives, and ARARs will be updated (e.g., changes in action-specific considerations) as the remedial alternatives are further developed.

4.7.3.1.6 Screening Evaluation

After alternatives have been assembled and adequately defined for evaluation, a screening step will be performed to narrow the list of alternatives that will be subjected to detailed evaluation. The screening will consider the factors of effectiveness, implementability, and relative cost in evaluating the alternatives. The screening process will be applied in a manner that retains practicable alternatives and also attempts to retain a range of options that use treatment technologies and permanent solutions to the extent practicable, and other technologies such as containment and institutional controls, as applicable. Remedial action objectives and a summary of the development and preliminary screening of remedial alternatives will be presented to USEPA.

4.7.3.1.7 Remedial Alternatives Screening Technical Memorandum

A Remedial Alternatives Screening (RAS) Technical Memorandum will be prepared that summarizes the work performed in and the results of each task identified above. The RAS Technical Memorandum will emphasize the use of tabular presentations of information in arrays that illustrate the comparative merits of various alternatives, the comparisons to screening criteria (effectiveness, implementability, and cost), and the rationale for retaining or eliminating alternatives. The RAS Technical Memorandum will also summarize action-specific ARARs for retained alternatives. Prior to submittal of the RAS Technical Memorandum, a presentation will be made to the USEPA, at a previously agreed upon time, of remedial action objectives and the alternatives screening process. The RAS Technical Memorandum will then be submitted to the USEPA in accordance with the provisions of the Settlement Agreement and SOW, while considering input received from the presentation. Comments received from the USEPA on the RAS Technical Memorandum will be incorporated in the detailed analysis of alternatives to follow (i.e., a modified Technical Memorandum will not be separately submitted, unless otherwise specifically requested by USEPA).

4.7.3.2 Detailed Analysis of Remedial Alternatives

The detailed analysis is the last phase of the OU 3 RI/FS process. Its purpose is to evaluate alternatives so that a preferred alternative will emerge. This phase can be broken down into the following major components:

- Evaluation of Alternatives Against Established Criteria
- Comparative Analysis

4.7.3.2.1 Evaluation Against Established Criteria

In this phase each remaining alternative will be evaluated against the seven threshold and primary balancing criteria established under CERCLA. Sufficient analysis will be performed both quantitatively and qualitatively to allow for a remedy to be selected. The seven evaluation criteria are as follows:

1 Overall protection of human health and the environment

2 Compliance with ARARs

3 Long-term effectiveness and permanence

4 Reduction of toxicity, mobility, or volume

5 Short-term effectiveness

6 Implementability

7 Cost

In addition to the above, two criteria are typically applied following release of the RI/FS report to the general public and through the Record of Decision process:

8 State (or support agency) acceptance

9 Community acceptance

The individual analysis of each alternative against the above criteria will include sufficiently detailed descriptions of the alternatives to understand processes, types and sequences of process units, and layout (e.g., site sketches); the remedial strategy; and key ARARs. The analysis of the alternatives against the criteria will be presented in a format which will facilitate evaluation (e.g., tabular formats) and comparisons.

4.7.3.2.2 Comparative Analysis

The purpose of the comparative analysis will be to identify advantages and disadvantages among alternatives. Alternatives will be compared against each other based on the evaluation criteria and then ranked.

4.7.3.2.3 Remedial Alternatives Evaluation Technical Memorandum

Upon completion of the individual and comparative analyses of alternatives, a Remedial Alternatives Evaluation (RAE) Technical Memorandum will be prepared that summarizes the results of the evaluation of the alternatives. The RAE Technical Memorandum will provide narrative descriptions of the alternatives and of the evaluation process, with an emphasis on tabular presentation of the evaluation to facilitate understanding and review, and with appropriate attachments as necessary to properly illustrate the work (e.g., site sketches that illustrate alternatives). If USEPA provides comments on the RAE Technical Memorandum, the comments will be incorporated in the FS report to follow (i.e., a resubmittal of the technical memorandum is not anticipated, unless otherwise specifically requested by USEPA).

4.8 FEASIBILITY STUDY REPORT (SOW TASK IX)

4.8.1 Purpose

The final step in the FS process is to prepare the FS Report. The purpose of the FS report will be document the various steps used to identify, develop, and evaluate remedial alternatives, based on the results of the RI Site Characterization, Baseline Risk Assessment, and treatability studies, if performed, that were the subject of the interim deliverables and tasks identified up to this point.

4.8.2 Approach

The OU 3 FS will present the analysis of alternatives and a cost-effectiveness analysis, in accordance with the National Contingency Plan (NCP), 40 CFR Part 300, as well as relevant guidance, and which reflects the findings in the approved Baseline Risk Assessment.

In general, the FS Report will include discussions of remedial action objectives, general response actions, identification and screening of technologies, identification and screening of remedial alternatives, evaluation of the alternatives, and comparative analysis of alternatives. The approach to compiling and presenting this information will be focused on decision making (e.g., tabular materials that facilitate ranking and comparisons).

4.8.3 Scope of Work

4.8.3.1 Draft Groundwater Feasibility Study.

The OU 3 FS Report draft will be prepared and submitted to the USEPA. The draft will contain the information generated through completion of the work outlined in the previously described FS-related tasks in this Work Plan, which includes methods and results for the identification of remedial technologies, development and screening of remedial alternatives, evaluation of the alternatives, and comparative analysis of alternatives. More specifically, the report will include the following components, as applicable:

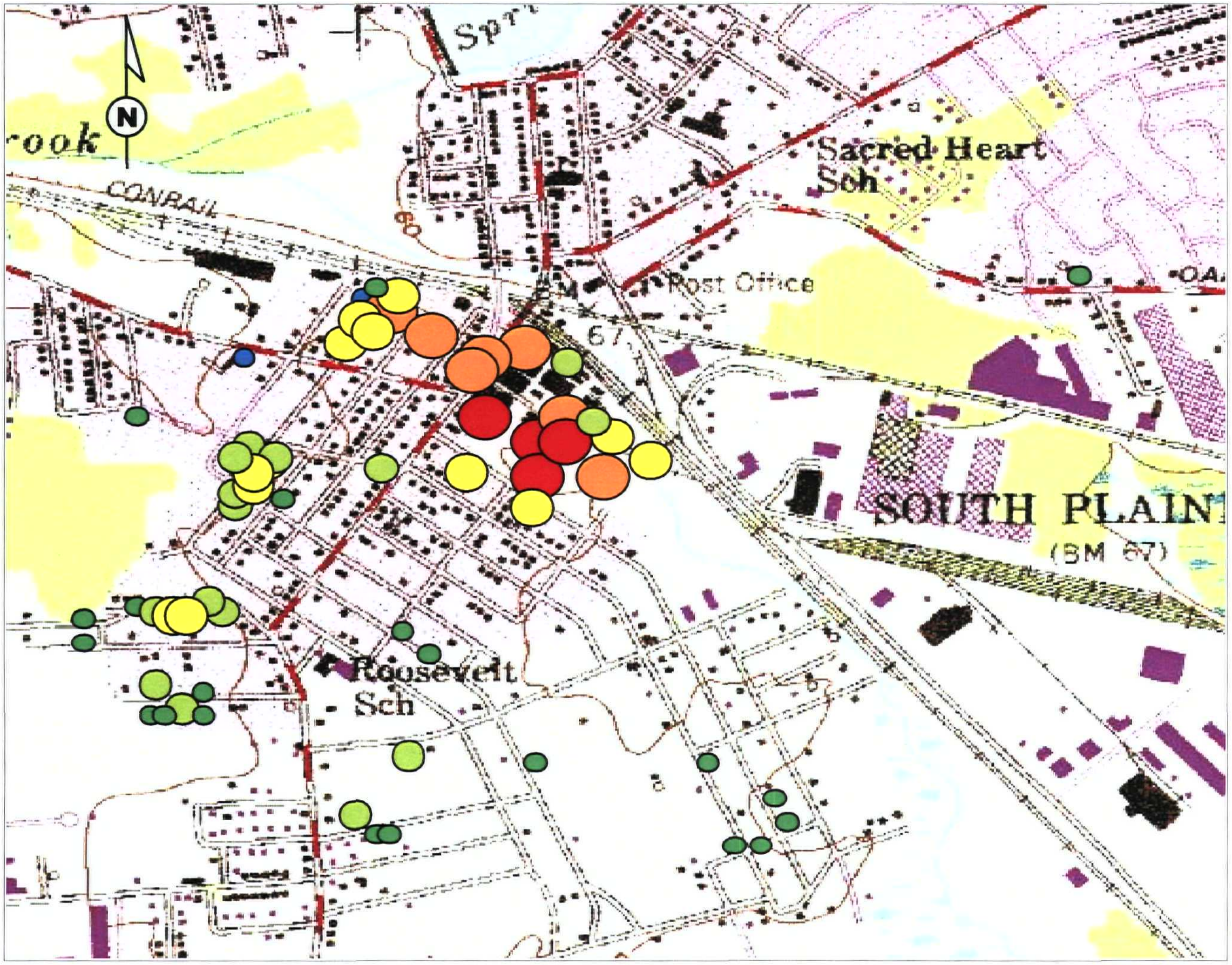
- Narrative to provide Site background and history.
- Description and summary of the hydrologic, hydrogeologic, and geologic Site characteristics. This may include maps and cross-sections as appropriate.
- Description and summary of the nature and extent of contamination, which will include tables used to identify the contaminants and maps and cross-sections to show concentrations and distribution.
- Description and summary of the BHHRA, which will include tables listing the COPCs and action levels.
- Description and summary of the treatability studies, if they are performed, including lab and pilot test data and testing methods and techniques.
- Description and summary of the remedial alternatives development and screening process. This will include the identification of candidate technologies, development and screening of remedial alternatives, evaluation of the alternatives, and comparative analysis of alternatives. Tables, maps, figures, and additional data will be provided, where applicable, to sufficiently translate the results and findings of the OU 3 FS.

4.8.3.2 Feasibility Study Presentation.

Within two weeks following the draft submittal, a presentation will be made to USEPA and the State to summarize the findings of the OU 3 FS, and to discuss the USEPA's and the State's comments on the draft submittal. The presentation will be prepared in a format that is suitable to portray the overall results of the FS (e.g., maps, figures, tables, lists, etc., employing Microsoft PowerPoint, presentation boards, etc., as appropriate).

4.8.3.3 Final Feasibility Study Report

Based on the input from the presentation of the draft FS Report, a final report will be prepared for submittal to USEPA. This report will reflect comments received from USEPA and the State.



LEGEND

TCE Levels

- **<1.0 ug/l**
- **1.0-10 ug/l**
- **10-100 ug/l**
- **100-1,000 ug/l**
- **1,000-10,000 ug/l**
- **>10,000 ug/l**

Approximate Scale: 1 in = 1700 ft

Data taken from Plate 3 "Half Mile Radius Ground Water Well Location Map, ENVIRON, 2/8/05

Figure 4-1
TCE Levels in Bedrock Groundwater

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

REPLACE
WITH
MAP(S)

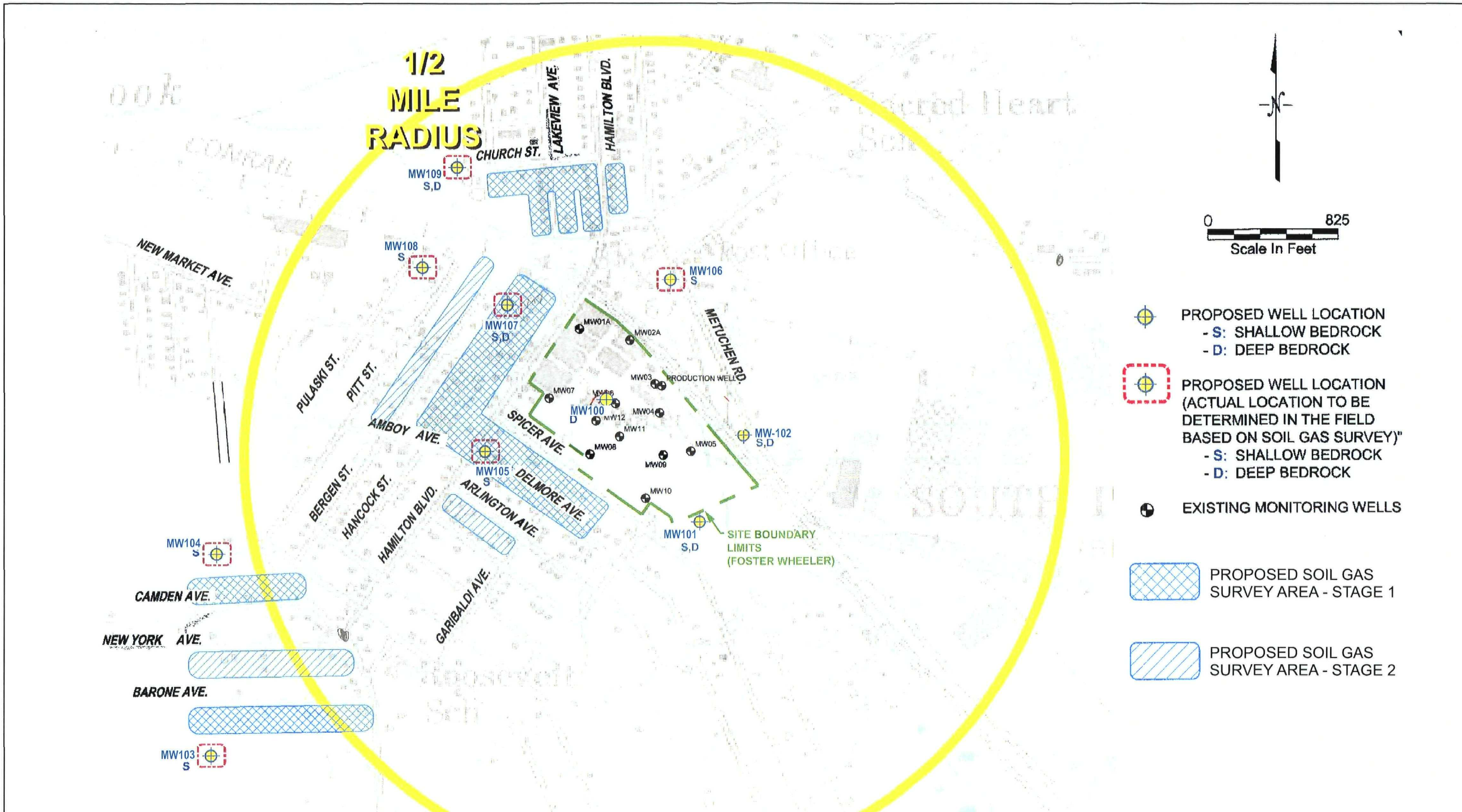


Figure 4-3
Proposed Groundwater
Monitoring Well Locations
OU-3 RI/FS Work Plan

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

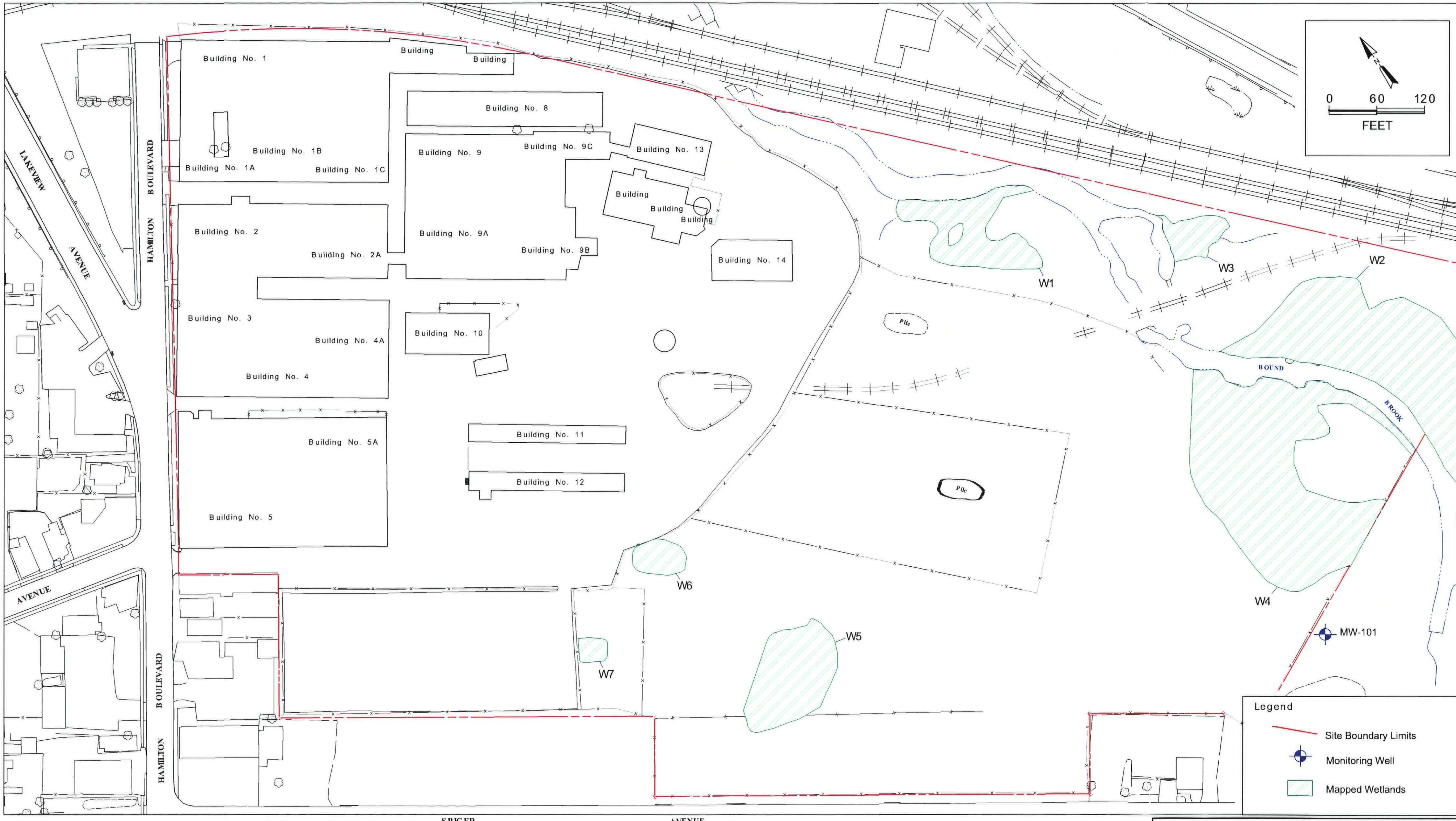


Figure 4-4
Location of Proposed Monitoring Well MW-101
in Relation to Mapped Wetlands
OU-3 RI/FS Work Plan

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

NOTE: MAP DERIVED FROM FIGURE 3-11
PREPARED BY FOSTER-WHEELER
ENV. CORP., DATED MAY 8, 2001

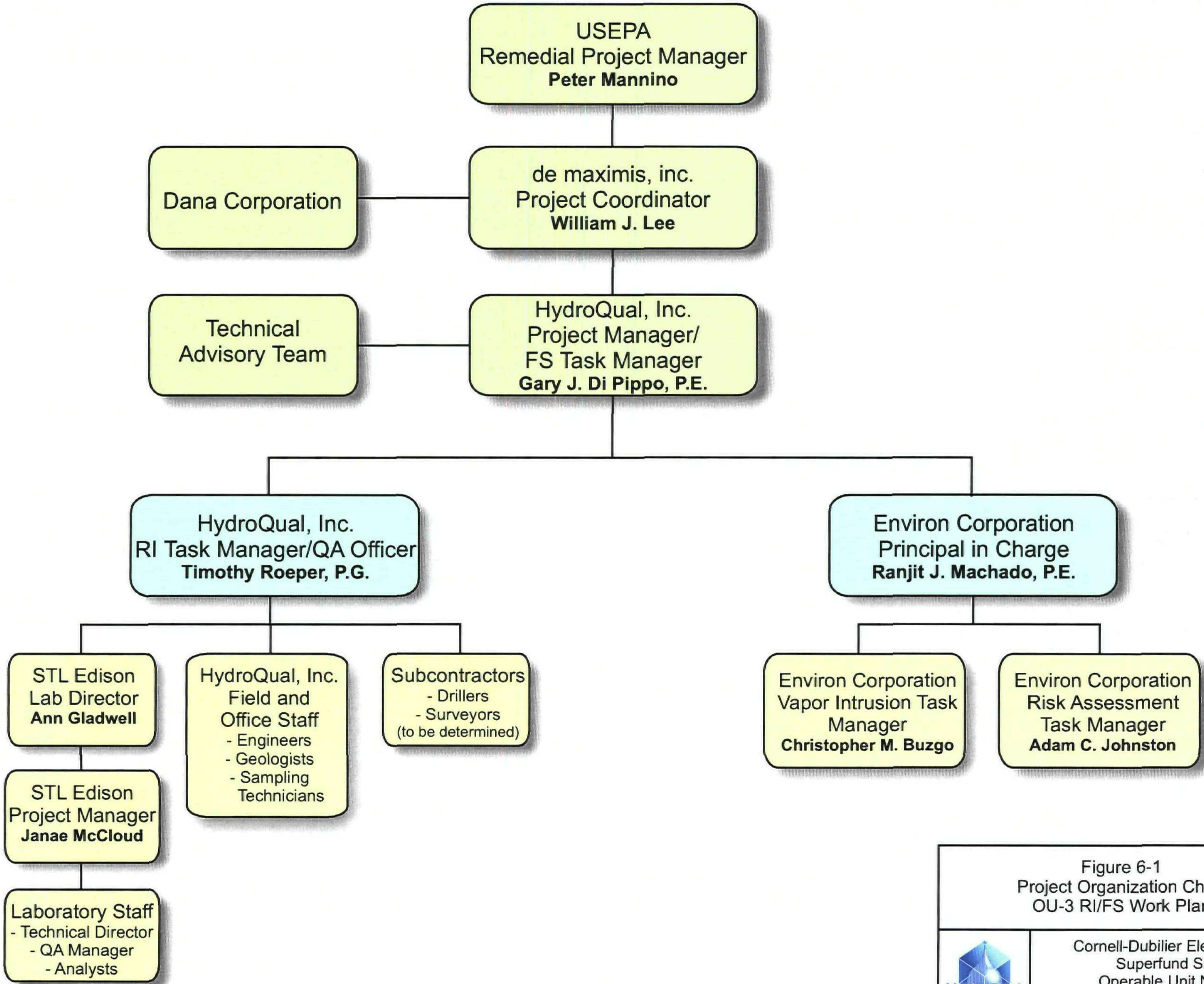


Figure 6-1
Project Organization Chart
OU-3 RI/FS Work Plan

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

SECTION 5

SCHEDULE

A schedule for the implementation of the OU-3 Work Plan activities is presented in Figure 5-1. The schedule is based on best estimates of the time necessary to complete the various activities required for the work and for compliance with the schedule requirements of the SOW and the Settlement Agreement. The schedule is based on the scope of work and sequence of work as described in this Work Plan as well as the following assumptions:

- Actual dates will be predicated on the date of approval of this Work Plan.

- USEPA review of various submittals occurs throughout the work. USEPA's review time in the schedule is typically shown as 30 working days. The schedule will be adjusted based on the actual amount of time that the Agency may choose to complete its review of submittals.

- Each submittal is assumed to go through one iteration (i.e., USEPA review and comment, followed by resubmittal in response to comments, leading to final approval). Differing approval processes will affect the schedule accordingly.

- Laboratory analyses as described in this Work Plan are assumed to be on a standard laboratory turn around time of three to four weeks for groundwater data and two to three weeks for air data (TO-15).

- The schedule assumes that there will be reasonable cooperation of the involved parties in granting access to off-site drilling locations. If access is not forthcoming in a reasonable time frame, the schedule will be impacted and USEPA's assistance will be sought.

- The SOW contemplates the possibility of treatability studies; however, the need for such studies has not been established at this time nor is it possible to define the scope of work at this time, assuming treatability studies are undertaken. Therefore, the schedule shows a task for determining the need for treatability studies, and if undertaken, the schedule will be adjusted according to the actual scope of work, the requirements of the Settlement Agreement and SOW, and schedule approval from USEPA.

SECTION 6

PROJECT ORGANIZATION

The organizations and key individuals involved with the OU-3 RI/FS Work Plan implementation are illustrated in Figure 5-1. The roles and responsibilities of the identified companies and individuals are summarized below.

United States Environmental Protection Agency (USEPA)

Mr. Peter Mannino will act as the Remedial Project Manager on behalf of the USEPA. In this role, Mr. Mannino will be the point of contact with the Federal government for the transfer of information including progress reports, analytical data, reports, etc. Mr. Mannino, on behalf of USEPA, will be responsible for the review of the data and submittals developed under this Work Plan for conformance with the provisions of the Settlement Agreement and the approved Work Plan.

USEPA's Region 2 Quality Assurance Reviewer, to be designated by USEPA, will be responsible for the review and approval of the FSP/QAPP associated with this project.

de maximis, inc.

Mr. William J. Lee will act as the Project Coordinator on behalf of Dana Corporation. In this role, Mr. Lee will be responsible for overall project management and coordination among Dana, USEPA, and HydroQual, Inc. In addition, Mr. Lee will have overall responsibility for implementing the work in accordance with the approved Work Plan and the Settlement Agreement.

HydroQual, Inc.

HydroQual, Inc. will act on behalf of Dana Corporation as the Contractor performing the OU-3 RI/FS work for the Site and will perform, direct, and oversee implementation of the investigative and engineering work called for in this Work Plan.

Mr. Gary J. DiPippo, P.E. is the overall Project Manager and will also serve as the Task Manager for the FS-related tasks. Mr. DiPippo will have overall responsibility for maintaining communication with the Project Coordinator as well as for implementing the project in accordance with the approved Work Plan.

Mr. Timothy R. Roeper, P.G. will serve as the Task Manager for the RI and in that role will also function as the QA Officer. In this role, Mr. Roeper will be responsible for implementing the QA procedures defined in the FSP/QAPP attached to this Work Plan, and with coordinating with the Project Coordinator, the laboratory's QA Manager and additional subcontractors as necessary. Mr. Roeper will manage implementation of the Work Plan activities for the OU-3 investigation.

ENVIRON Corporation

ENVIRON Corporation (ENVIRON) will serve as a subcontractor to HydroQual, assisting with the risk assessment and vapor intrusion aspects of the work. Mr. Ranjit Machado will be the Principal in Charge for ENVIRON and will have overall responsibility for communication and coordination with the HydroQual Project Manager and for performance of the work in accordance with the approved Work Plan and the provisions of the Settlement Agreement. Mr. Christopher Buzgo will serve as the Task Manager for the vapor intrusion work. Mr. Adam Johnston will serve as the Task Manager for the risk assessment work.

STL Edison

STL Edison will provide the laboratory analytical services associated with the OU-3 groundwater investigation. Ms. Janae McCloud is STL Edison's Project Manager for the work. Ms. McCloud will manage the day-to-day activities associated with the analytical program for the RI. Mr. Carl Armbruster will serve as the QA Manager for the laboratory and in this capacity he will implement QA procedures defined in the QAPP and in the laboratory's SOPs. Ms. McCloud will report to Ann Gladwell, the STL Laboratory Director. Mr. Michael Urban will be STL's Technical Director. Ms. Gladwell and Mr. Urban will have overall responsibility for the laboratory performance.

Technical Advisory Team

A Technical Advisory Team will provide input to the project team for state-of-the-science technical support and review of strategic and key technical matters. The Technical Advisory Team will consist of Dr. John A. Cherry and Dr. Beth L. Parker of the University of Waterloo for DNAPL, fractured rock, and matrix diffusion issues; Robert D. Mutch Jr. and William G. Soukup of HydroQual, Inc. for fractured rock, DNAPL, matrix diffusion, and groundwater modeling issues; and Dr. Joseph V. Rodricks of Environ for risk assessment and indoor air issues.

Qualifications of the various project team members were previously submitted to the USEPA, on July 5, 2005, in accordance with Article VIII, Paragraph 32 of the Settlement Agreement.

SECTION 7

REFERENCES

Preliminary Conceptual Site Model, Cornell-Dubilier Electronics Superfund Site, HydroQual, Inc., (September 19, 2005).

Technical Proposal, Groundwater Remedial Investigation/Feasibility Study (RI/FS) Operable Unit 3, Cornell-Dubilier Electronics Superfund Site HydroQual, Inc., (April 29, 2005).

Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water" (EPA/600/R-98/128),

Interim Final Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual (Part A), (December 1989) (EPA/540/1-89/002).

Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments, (1997).

Land Use in the CERCLA Remedy Selection Process (OSWER Directive No. 9355.7-04)

Interim Final Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual (Part D Standardized Planning, Reporting and Review of Superfund Risk Assessments)," (January 1998) (EPA/540/R-97/033).

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Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (USEPA, 1988).

Environmental Response Team (ERT) Standard Operating Procedure (SOP) #2042, Soil Gas Sampling (USEPA June 1996).

Draft Standard Operating Procedure for Installation of Sub-Slab Vapor Probes and Sampling Using EPA Method TO-15 to Support Vapor Intrusion Investigations (USEPA 2002).

ATTACHMENT B

HEALTH AND SAFETY PLAN (HASP)

HydroQual

Environmental
Engineers & Scientists

HEALTH AND SAFETY PLAN
FOR
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
OPERABLE UNIT NO. 3 (OU-3) GROUNDWATER

Prepared for:

Dana Corporation

Prepared by:

HydroQual, Inc.
1200 MacArthur Blvd.
Mahwah, New Jersey 07430

January 2006

HEALTH AND SAFETY PLAN
for
Remedial Investigation/Feasibility Study
Cornell-Dubilier Electronics Superfund Site
Operable Unit No. 3 (OU-3) Groundwater

Prepared by:	Leslie Sparrow	Date:	January 20, 2006
Updated by:		Date:	
	Effective ________ through ________		
Reviewed/Approved by:	____________________ Health and Safety Director	Date:	____________
Reviewed/Approved by:	____________________ Gary DiPippo Project Manager	Date:	____________

This document has been prepared in fulfillment of a requirement within the Administrative Settlement Agreement and Order on Consent (Settlement Agreement) for Remedial Investigation/Feasibility Study for Operable Unit No. 3 (OU-3), at the Cornell-Dubilier Electronics Superfund Site. The Settlement Agreement requires the submittal of a Health and Safety Plan for the activities to be undertaken under the Settlement Agreement. Any company, agency, or other entity of any kind that employs personnel for work at the site is solely responsible for its own health and safety program and the health and safety of its own employees. This requirement is based on OSHA regulations, which recognize the employer-to-employee responsibility for health and safety. In an effort to assist other entities working at the site, and to comply with hazard communication requirements, HydroQual, Inc. will provide a copy of the site health and safety for this project to any entity working at the site that requests such a copy. However, this does not relieve, in any way, the responsibility for each entity to prepare and implement its own Health and Safety Plan.

Due to the hazardous nature of activities occurring as part of the OU-3 work and the potential presence of hazardous materials, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered and this document does not guarantee the health and safety of any person entering the site of the work. Strict adherence to the health and safety guidelines presented herein will reduce, but not eliminate, the possibility for injury at this site. Guidelines presented herein are site specific and should not be used for other sites without research and evaluation by a qualified health and safety specialist.

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SECTION 1

INTRODUCTION

1.1 SCOPE AND APPLICABILITY OF HEALTH AND SAFETY PLAN

The purpose of this Health and Safety Plan (HASP) is to identify, evaluate, and control potential safety and health hazards and to provide emergency response procedures to incidents that may occur during field operations performed during the Remedial Investigation/Feasibility Study (RI/FS) for the Cornell-Dubilier Electronics Superfund Site (CDE) Operable Unit 3 (OU-3) Groundwater. CDE is located at 333 Hamilton Boulevard, Borough of South Plainfield, Middlesex County, New Jersey. Field operations may involve well drilling and installation, vapor intrusion testing, aquifer testing, water level measurements, groundwater sampling, and investigation derived waste handling and sampling. These activities may be performed on the CDE Site or in locations adjacent to the CDE Site, which will be referred to as off site for the remainder herein. This HASP has been prepared pursuant to the requirements of an Administrative Settlement Agreement and Order on Consent between Dana Corporation and the US Environmental Protection Agency and is intended solely for that purpose. Any company, agency, or other entity of any kind that performs work at the site is solely responsible for preparing and implementing a health and safety plan for its own employees, and a copy of this health and safety plan will be provided as a convenience, but in no way alters responsibility for the health and safety of its employees.

This HASP was prepared in accordance with EPA's Standard Operating Safety Guide (PUB 9285.1-03, PB 92-963414, June 1992) and complies with the standards of the Occupational Safety and Health Administration (OSHA) as stated in 29 CFR with emphasis on subsections:

1910.120	(Hazardous Waste Operations and Emergency Response),
1910.1000	(Toxic and Hazardous Air Contaminants),
1910.1200	(Hazard Communication, Employee Right-to-Know Law),
1904	(Recording and Reporting Occupational Injuries and Illnesses),
1990	(Identification and Regulation of Potential Occupational Carcinogens),
1926	(Safety and Health Regulations for Construction); and other applicable federal and state statutes or regulations.

Amendments to this Plan will be made as the contaminant profile information is updated, a change in work status or task is made, or as regulatory requirements dictate. Changes to this Plan will be brought to the attention of people covered under the Plan through additional training and appropriate notification as required.

1.2 OBJECTIVES OF THE HEALTH AND SAFETY PLAN

The objectives of this HASP include the following:

- Identify and evaluate potential work site hazards.
- Identify key personnel and emergency response contacts.
- Define work activities and match personal protection equipment to tasks.
- Establish secure work zones to minimize the spread of contaminants.
- Establish and document air monitoring procedures.
- Implement standard operating procedures to protect workers.
- Provide emergency response procedures.
- Confirm personnel medical monitoring.
- Confirm current HAZWOPER personnel training.
- Provide and implement decontamination procedures.
- Provide appropriate documentation for confined space entry and waste disposal.

1.3 SITE BACKGROUND

The former CDE facility, now known as the Hamilton Industrial Park, consists of approximately 26 acres containing 18 buildings that are currently used by a variety of commercial and industrial tenants (see Figure 1-1). During the period of its operations, CDE is reported to have disposed of PCB-contaminated materials and other substances at the Site, and previous Site investigations indicate elevated concentrations of VOCs, SVOCs, Pesticides, PCBs, and metals in the on-site soils and sediments. Groundwater analytical results indicate elevated levels of VOCs, PCBs, and pesticides, with PCBs present likely as a result of cosolvency effects due to high VOC concentrations as well as suspended solids. Soils containing elevated levels of VOCs, PCBs, and pesticides, thus appear to represent a source to groundwater. However, metals found at elevated levels in the soils were not found in the groundwater. Therefore, soils impacted by metals do not appear to be a source to groundwater. SVOCs and pesticides detected in soils were also not routinely detected in groundwater and also do not appear to be a significant source to groundwater. However, several SVOCs and pesticides were detected in groundwater at the Site.

Investigations by NJDEP between January 1987 through October 1990 identified the presence of chlorinated solvents, most notably trichloroethene (TCE) and tetrachloroethene (PCE), in residential wells located to the south, southwest and west of the Site (Pitt Street Private Well Study Area). TCE has been the most frequently detected constituent in bedrock groundwater. Other detected VOCs in bedrock groundwater included the PCE/TCE breakdown products of cis-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride as well as 1,1,1-trichloroethane, carbon tetrachloride, methyl-tert-butyl ether (MTBE), chloroform and toluene. There may be various sources of the VOCs identified above. Nonetheless, all these constituents may be encountered in either on-site or off-site work, and therefore, the constituents noted in Table 3-1 are considered in this HASP because they may potentially represent an occupational health hazard during certain field operations.

As future data are generated, they will be reviewed and, if necessary, this HASP will be revised and amended accordingly.

1.4 FIELD ACTIVITIES FOR THE WORK PLAN

The activities to be conducted as part of the HASP have been identified and discussed in detail in the Work Plan. The work has been divided into six (6) individual field activities as summarized on Table 1-1 with additional details described in Section 3.0, Health and Safety Hazards.

1.5 PERSONNEL REQUIREMENTS

To promote safe work practices, no inherently hazardous activity will be conducted by an individual employee working alone. At least one contractor employee and an employee of the drilling company will be present at the site during intrusive field activities such as well drilling and installation. During typical work activities, such as water level monitoring and groundwater sampling, the buddy system is suggested, but not required. Installation of staff gauges along Bound Brook will utilize the buddy system.

Best Management Practices require the wearing of safety glasses with side shields by personnel in site areas where work is being conducted. Hard hats may also be required at certain times in designated areas. Designated areas and times that require the use of hardhats will be decided by the Site Safety Officer (SSO), and discussed in a site safety meeting. A monthly site safety meeting will be conducted to address current site conditions and operations which affect site personnel. Daily site meetings will be held on an as needed basis to discuss changes in work or Personal Protective Equipment (PPE), and to discuss accidents that may have occurred on the previous day. Accidents or incidents that have occurred will be discussed and prevention methods implemented during daily site safety meetings.

1.6 DEFINITIONS

The following terms have been described in the HASP:

- **"Authorized Personnel"** – Any person, such as task-specific personnel, project personnel, oversight personnel, contractors, and consultants whose presence is authorized at the project site.

- **"Contractor/Consultant"** – Any person or firm, retained or hired by Dana Corporation, to carry out and/or supervise any portion of the activities conducted at the Project Site.

- **"Exclusion Zone"** – the area in which all entering personnel must be directly involved in the ongoing work, have designated personal protective equipment (PPE), and meet training and medical monitoring requirements. This includes any activity which disturbs groundwater or sediments at this site. The exclusion zone will be defined by an approximate 25-foot radius around the work area, which will be suitably marked.

- **"MSDS"** – Material Safety Data Sheet, which provide information on the physical, chemical, and hazardous properties of chemical compounds that may brought on the site by authorized contractor personnel, and the constituents of concern present at the site

- **"Oversight Personnel"** – Any person designated by the state government, federal government, or Dana Corporation who is assigned to carry out oversight work. Oversight personnel must comply with the requirements of this HASP.

- **"ppm"** – Parts per million; expressed as PPM(v) for gases and vapors.

- **"Project Manager"** is responsible for the overall direction and completion of the project.

- **"Project Health and Safety Manager"** – The designated person responsible for the overall content, proper implementation, and maintenance of this site HASP. This person is also responsible for the identification of hazards which are not discussed in the Plan. Upon a major change in planned activities, the Project Health and Safety Manager shall evaluate the effectiveness of the PPE program for the site and for the planned activities. This shall include reviewing the site inspection notes, employee use and decontamination of PPE, review of site air monitoring and calibration data, and consideration of possible PPE program modifications. This report shall be made available to site personnel.

- **"Task Manager"** is responsible for the direction and coordination of the field activities.

- **"Project Personnel"** – Any person or contractor, its consultants, or its contractors to carry out work at the Project Site (e.g., Project Manager, etc.).

- **"Project Site"** – The area defined by a specific project Work Plan, as well as contiguous areas to which access is required for the execution of the field tasks which may be set forth in a Work Plan.

- **"Secure Zone"** – The area within a radius of approximately 50 feet established from the center of the work area (e.g., drilling site) and indicated by a visible surface device. Personnel entering a secure zone must have the designated PPE and meet the training and medical monitoring requirements.

- **"Site Safety Officer"** – The person(s) designated by the Contractor/Consultant who is responsible for supervising the HASP. This person is responsible for conveying the information contained in the HASP to the workers present on site, and in the absence of the Project Health and Safety Manager from the site, will fulfill the obligations of the Project Health and Safety Manager. This includes attendance at Site Safety meetings, conducting site training and orientation sessions, reporting all incidents which happen to personnel under his/her supervision, the timely submission of required forms, and selection of proper PPE, if the need arises to make changes.

- **"Site Safety Officer (Alternate)"** is responsible for fulfilling health and safety duties in the absence of the Site Safety Officer.

- **"Support Zone"** – the appropriate location, outside of the exclusion zone, for a command post. This area will be used as a medical station, equipment and supply location, and for any other administrative or support functions necessary for efficient operations at the site. Any potential contaminated equipment or clothing must remain outside of the support zone. Periodic monitoring should be conducted to ensure that this area remains free from contamination.

- **"Task-Specific Site Personnel"** – Any person or contractor and/or its consultants/contractors to carry out work at the project site.

TABLE 1-1

LIST OF WORK ACTIVITIES FOR OU-3 GROUNDWATER
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NJ

1. Well Drilling and Installation: includes drilling, rock coring, well installation, borehole geophysical testing, packer tests, field screening of groundwater for VOCs, and rock core sampling for matrix diffusion testing;

2. Aquifer Testing: includes water level measurements, groundwater pumping, and water management;

3. Groundwater Sampling;

4. Water Level Monitoring: includes installation of staff gauges in Bound Brook;

5. Vapor Intrusion Testing: includes vapor probe installation, soil gas testing and indoor air testing;

6. Investigation Derived Waste Handling and Sampling: includes drill cuttings and well development/purge/sampling water.

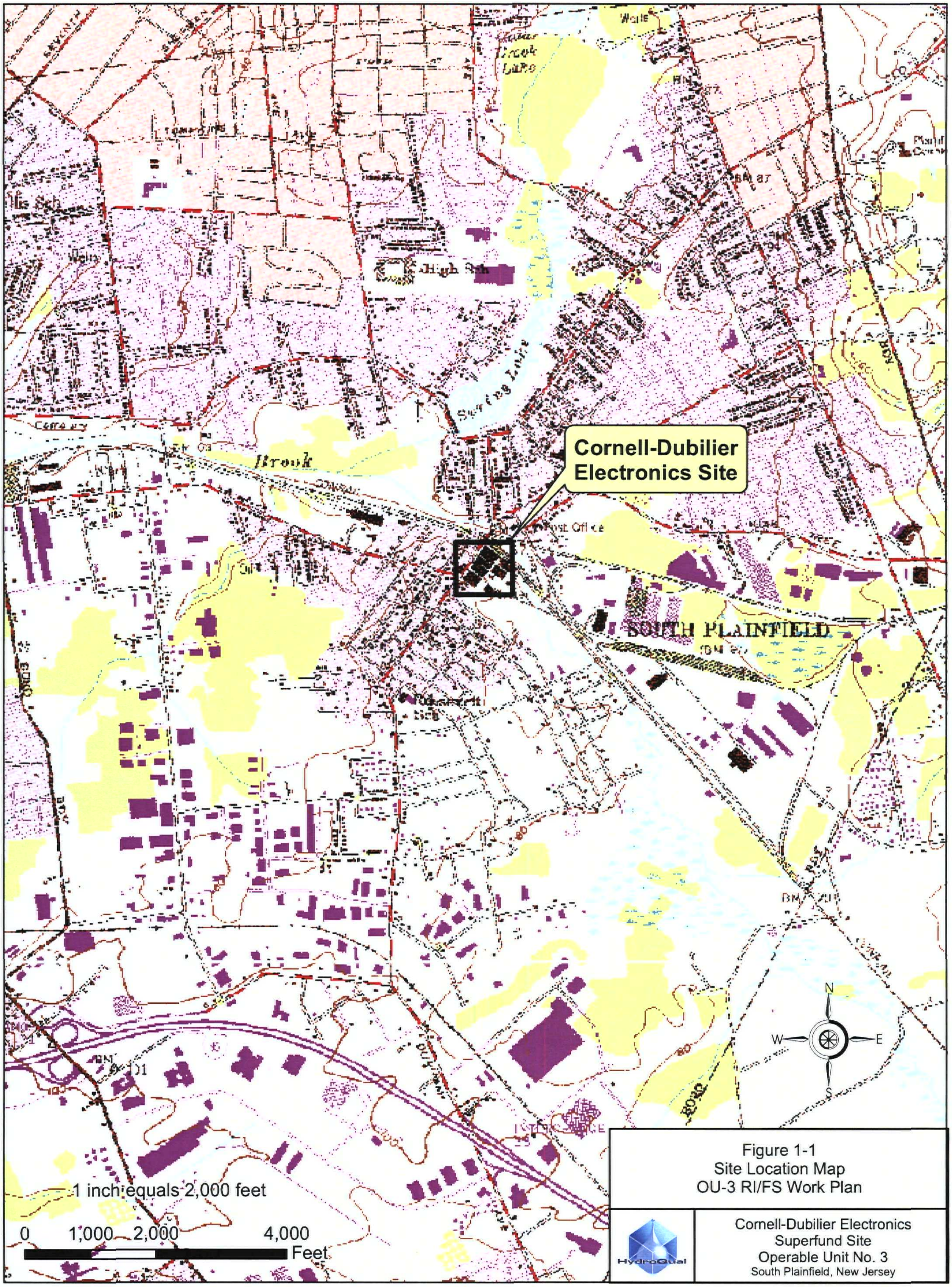


Figure 1-1
Site Location Map
OU-3 RI/FS Work Plan

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

SECTION 2

PERSONNEL AND SITE DOCUMENTATION

2.1 KEY PERSONNEL

The HydroQual, Inc. Project Health and Safety Manager for this project will be Timothy Roeper, who is also the Task Manager for the OU-3 Remedial Investigation. In this capacity, Mr. Roeper will oversee compliance with the HASP. Under Mr. Roeper's direction, day-to-day site safety activities will be overseen by the Site Safety Officer, who will be designated at the time the work is scheduled. Safety is affected by the actions of involved parties or organizations. For this reason, the following list of key personnel from HydroQual, Inc. and other companies have been identified.

HydroQual, Inc.	Personnel	Phone Number
Project Manager	Gary DiPippo	201-529-5151, ext. 7175
RI Task Manager	Tim Roeper	201-529-5151, ext. 7173
Project H&S Manager	Tim Roeper	201-529-5151
Site Safety Officer	TBD	201-529-5151
Alternate Safety Officer	TBD	201-529-5151
Other Companies		
ENVIRON Project Director	Ranjit Machado	703-516-2358
ENVIRON Vapor Intrusion Site Contact/Coordinator	Christopher Buzgo	609-243-9871

Descriptions of personnel functions and responsibilities are previously defined in Section 1.6.

2.2 SITE VISITORS

First time visitors to the site must receive site orientation from the Site Safety Officer prior to entering the site. Orientation must include identification of restricted areas such as Exclusion Zones and active operations, site emergency procedures and equipment, emergency phone numbers, and directions to the local hospital.

Visitors and contractor personnel whose work activities require entry into the Exclusion Zone must acknowledge their understanding of the HASP. In addition, these contractors must comply with the general requirements found in "Personnel Training Requirements" (Section 4.0), "Personal Protective Equipment" (Section 5.0), "Medical Surveillance Requirements" (Section 6.0), "Site Control Measures" (Section 8.0) of this HASP.

Personnel entering the site are required to acknowledge reading the HASP (Figure 2-1), to sign the visitor entry/exit log (Figure 2-2), and to adhere to the Plan requirements while on or off-site.

2.3 SITE SAFETY OFFICER DUTIES

On a daily basis during field operations, the Site Safety Officer will visually inspect site activities for compliance with the HASP. Appropriate information of this inspection will be noted on the Health and Safety Site Daily Log (Figure 2-3). Deficiencies in compliance will be corrected as soon as practical. The remedial action taken will be noted on the Health and Safety Site Daily Log as well as when the remedial action is completed. The following items further define the responsibilities of the Site Safety Officer:

- Complete the Health and Safety Site Daily Log. Note deviations from the site HASP in the Health and Safety Site Daily Log , record why deviations occurred, and record follow-up action(s) taken.

- Have visitors sign in and out of the Visitor Logbook.

- Verify visitor training and medical clearance records for those visitors and contractor personnel conducting site field activities. Visitors or contractors must complete the Personnel Acknowledgment form indicating their understanding of the key elements of the site HASP.

- Provide site visitors with a safety orientation to include an overview of safety procedures, active operations in restricted areas, required personal protective equipment, location of emergency equipment, and the site emergency procedures. First-time visitors to the site must be accompanied by the Site Safety Officer.

- The Site Safety Officer will interpret the basic requirements of the HASP and request non-compliant visitors to leave the site as applicable.

Monthly site safety meetings will be conducted to address current site conditions and operations which affect site personnel. Changes in PPE levels, results of environmental monitoring, accidents or incidents that have occurred will be discussed and prevention methods implemented.

FIGURE 2-1

PERSONNEL ACKNOWLEDGMENT
<u>TO BE SIGNED AND RETURNED TO</u>
<u>SITE SAFETY OFFICER</u>

I have received, carefully read, and have signed the Site Health and Safety Plan (HASP) for the Cornell-Dubilier Electronics Superfund Site OU-3. I agree to abide by these safety rules, regulations, and guidelines while working at the Cornell-Dubilier Electronics Superfund Site, and understand that a violation of these rules may result in my removal from the site.

I have received and completed training in the subjects listed below that address specific hazards associated with hazardous waste site work.

- Work Rules and Safety Requirements
- Personal Protective Equipment (PPE)
- Potentially Hazardous Chemicals
- Emergency Equipment
- Reporting of Injuries and Illnesses
- Emergency Procedures
- Job Assignment
- Personal Hygiene
- Motor Vehicle Equipment
- Standard Operating Procedures

I affirm that I have received 24 or 40 hours of initial HAZWOPER Training (or equivalent) per 29 CFR 1910.120(e). This training included the proper use and fitting of an appropriate respirator. I have received my initial training or 8 hours of annual refresher HAZWOPER training within the last 12 months.

Signature ________________________________ Date ______________

Print Name ____

Employer Name ____

* *

I reviewed the training and medical documents provided by the above named individual and have found them to be within the time frames specified by 29 CFR 1910.120.

HYDROQUAL INC. SITE SAFETY OFFICER

Signature ________________________________ Date ______________

Print Name ____

FIGURE 2-2

VISITOR SIGN IN SHEET

Date	Name	Representing	Time In	Time Out	Safety Plan Read?	Site Location Visited	Protective Clothing Required?	Remarks

FIGURE 2-3

OU-3 Groundwater	HEALTH AND SAFETY SITE DAILY LOG

Project: ____________________

Client: ____________________ Job No. ____________________

Location: ____________________ Instrument Readings & Specifications by: ____________________

Date: ____________________

Weather Conditions: ____________________ Hazards Noted: ____________________

Chemical: ____________________

Personnel On Site: ____________________

Site Instrument Readings:

☐ HNU or ☐ OVA ☐ Other ____________ Level of Protection: ____________

Calibration Date: ____________ Dress of the Day: ____________

	Reading	Time
Background:		
Perimeter Areas:		
Active Work Area:		

Changes During the Day: ____________

Explosion Meter:

Decontamination Procedures: ____________

	Reading	Time
Perimeter Areas:		
Active Work Area:		

Oxygen Meter:

	Reading	Time
Perimeter Areas:		
Active Work Area:		

Remedial Actions Taken: ____________

Date Remedial Action Complete: ____________

Other Readings: ____________

Site Safety Officer:

Name: ____________

Signature: ____________

Title: ____________

Work Planned: ____________

Work Area: ____________

SECTION 3

HEALTH AND SAFETY HAZARDS

3.1 HAZARD ANALYSIS FOR WORK ACTIVITIES

A hazard analysis for each identified work activity covered by this HASP can been found in Table 3-1. This table provides a summary of anticipated task activities for this site, associated task hazards, and protective measures to be followed to reduce the hazard potential. This table will be updated by the Project Safety and Health Manager as job activities change.

Precautions will be taken to avoid the following common work place hazards:

- Slips, Trips and Falls
- Electrical
- Mechanical
- Fire/Explosion
- Heat and Cold Stress
- Noise (Acoustical)

The Site Safety Officer will evaluate these potential hazards during site inspections. Routine and potential equipment hazards will be discussed during site safety meetings. Workers will be advised of known potential hazards at the site prior to beginning work, and, as required, if site conditions change. Equipment will be operated by trained personnel and employees will be cautioned during site safety meetings to be aware of moving equipment. Employees should be encouraged to be observant of site safety and health hazards, to watch out for other workers, and to report unsafe conditions to their supervisors and the Site Safety Officer.

Safety glasses with side shields, steel-toed boots, coveralls, hearing protection and hard hats will be required to be worn at certain times in designated areas. Fire extinguishers, respirators, first aid kits, and eyewash stations will be available for use as needed in the work area. Site workers will be trained in their use prior to arrival on site and visitors will be advised of their availability and location.

3.2 IDENTIFICATION OF POTENTIALLY HAZARDOUS CHEMICALS

Potentially hazardous chemicals present in the soils and groundwater at this site have been previously determined during earlier investigations, as described in Section 1.3. The potential routes of exposure to these site chemicals include: 1) inhalation of vapors or dusts from the drilling operations; 2) direct dermal (skin) contact or absorption of contaminants contained in the groundwater; and 3) ingestion by hand-to-mouth transfer of contaminants. For inhalation, prevention of exposure is accomplished by appropriate dust and vapor control measures and/or through the appropriate use of air-purifying or air-supplying respirators. For direct dermal contact or absorption, prevention of exposure is accomplished by the proper selection and use of protective clothing. For ingestion, prevention is accomplished through good hygiene practices, frequent hand washing, and enforcement of rules regarding eating, drinking, and smoking restrictions.

Site personnel will receive training about the potential chemical risks from these compounds. Appropriate site controls and personal protective equipment (PPE) will be utilized to further reduce potential chemical exposure. Based on the results of the previous investigations, it is expected that normal work activities to be conducted under this HASP would result in personnel exposures below the current occupational exposure limits.

Table 3-2 presents the chemicals of interest and their current occupational exposure levels. The Permissible Exposure Limits (PEL) established by the Occupational Safety and Health Administration (OSHA) reflect both the vacated final rule values of 1993 as well as the less stringent values found in the earlier Air Contaminants Standard (29 CFR 1910.1000). The Recommended Exposure Limits (REL) are from the 2005 edition of the NIOSH Pocket Guide to Chemical Hazards published by the National Institute for Occupational Safety and Health (NIOSH). Occupational exposure limits are based upon known and available medical, biological, engineering, chemical, trade, and other relevant information to reduce or eliminate the adverse health and safety effects of these chemicals. Additional chemical information on site constituents can be found in the NIOSH Pocket Guide to Chemical Hazards as well as in Material Safety Data Sheets (MSDS) for specific chemicals.

3.3 HAZARD COMMUNICATION PROGRAM

The OSHA Hazard Communication (Haz-Com) Standard found in 29 CFR 1910.1200, requires that hazard information on workplace chemicals be communicated to workers present at a site. The Project Health and Safety Manager will be responsible for the development and administration of the site Haz-Com program which includes the written program, a warning label system, MSDS information, and employee training.

MSDS information on calibration and decontamination chemicals brought to the site will be maintained on site for review in a separate document. Decontamination chemicals are discussed in Section 8.4 and identified in Table 8-1. Additional decontamination chemicals that may be considered are discussed in Appendix B. If additional decontamination chemicals are deemed necessary, this HASP will be revised and amended accordingly.

Contractors must supply the Project Health & Safety Officer and the Site Safety Officer with a list of chemicals that they will bring onto the site and the MSDS for each chemical. Contractors must also apply labels on chemical containers brought into the work place. When contractors are finished working at the site, they must either properly dispose of or take with them any unused chemicals brought onto the site.

3.4 DRILLING HAZARDS

Hazards that may generally be associated with drilling operations include the following:

- Potential exposure to volatile organic vapors (VOCs) during drilling activities and well installation.
- Noise levels exceeding the OSHA action level of 85 dBA may be a hazard and limit personnel communication. Noise levels exceeding the OSHA PEL of 90 dBA, may cause permanent hearing loss.
- Carbon monoxide fumes from the drilling rig.
- Overhead utility wires may present an electrical hazard both from direct contact and from arcing when the drill rig boom is in the upright position.
- Underground utility services may be ruptured or damaged during active drilling operations.
- Moving parts on the drill rig such as augers and catheads may catch loose clothing. In addition, free or falling parts from the drill rig may cause head injury. Moving parts may throw materials resulting in eye injuries.
- Movement of heavy equipment over uneven terrain may cause the rig to roll over or become stuck in a rut.

- High pressure hydraulic lines and air lines used on the drill rig may pose a hazard should they be incorrectly assembled or poorly maintained.

Hazard Prevention

- To minimize the potential of exposure to VOCs during drilling and well isntallation, an air monitoring device (Photo Ionization Device (PID)) should be used to monitor the breathing zone. Adequate protective clothing should be utilized to prevent dermal contact with groundwater and drill cuttings. PPE, including respiratory protection, will be assigned and utilized as needed depending on the results of the air monitoring and action levels established in this HASP.

- "Kill switches" will be tested daily and after repairs have been made to the drill rig. Personnel will be familiar with the location and operation of "kill switches".

- Drillers will daily inspect chains, hydraulic lines, cables, catheads, etc. for weak spots, frays, and other associated problems.

- Approved ear muffs and ear plugs will be used to reduce noise levels below the OSHA action level of 85 dBA. If you have difficulty in maintaining normal conversation levels, the site noise level likely exceeds the safe OSHA limit, and hearing protection must be worn. These situations could include, but are not limited to, equipment operators, hand tool use, treatment system operation, and pumping activities.

- Hard hats must be worn when working in a Secure Zone during drilling operations. Loose clothing will be secured, and the clearances will be checked prior to approaching the drill rig.

- The boom on the drill rig will be lowered to avoid contacting overhead lines. Overhead utilities will be considered "live" until determined otherwise. The rig mast will not be raised within 20 feet of an overhead electrical line until the line is de-energized, grounded, or shielded. The boom will also be lowered when moving the drilling rig. If it becomes necessary to de-energize a power line, the SSO will notify site workers when it has been de-energized upon notification from the Utility Company.

- An underground utilities search will be conducted before the commencement of a drilling project. Copies of relevant information (maps, etc.) will be provided to site workers after completion of a utilities search.

- Hydraulic lines will be checked prior to and during use.

3.5 AQUIFER TESTING/GROUNDWATER SAMPLING/WATER LEVEL MONITORING/VAPOR INTRUSION TESTING/WASTE SAMPLING HAZARDS

Potential hazards associated with sampling and monitoring are listed below:

- Potential exposure to volatile organic vapors (VOCs) when opening the wellhead.

- Back strain due to lifting bailers or pumps from down-well depths and moving equipment to well locations.

- Slip and fall potential from wet, muddy, or snow-covered surfaces created by spilled water or inclement weather.

- Slip and fall potential into Bound Brook during staff gauge installation due to proximity to bank.

- Electrical hazards associated with the use of electrical equipment around water or wet surfaces.

- Splash potential from groundwater onto the skin or into the eyes during sampling.

- Potential exposure to sample preservatives and decontamination chemicals.

Hazard Prevention

- To minimize the potential of exposure to VOCs when initially opening the wellhead or installing vapor probes, an air monitoring device (Photo Ionization Device (PID)) should be placed near the opening. The area of the breathing zone will also be monitored. Adequate protective clothing will be provided to prevent dermal contact with the groundwater. PPE, including respiratory protection, will be assigned and utilized as needed depending on the results of the air monitoring and action levels established in this HASP.

- Back strain can be prevented by employing proper lifting and bailing techniques. Heavy equipment will be lifted using proper lifting procedures. Lift with the legs, and when needed, get the help of others.

- Slipping on wet surfaces will be prevented by placing purged water in drums for removal. A boot with a good tread for traction will be used to minimize the potential of slipping.

- The buddy system will be utilized when working near open water (i.e., Bound Brook).

- Ground fault interrupters will be used when pumps are operated in or around wet conditions.

- Appropriate Modified Level D personal protective equipment (PPE), as detailed in Section 5, will be utilized to protect from site contaminants as well as preservative and decontamination chemicals. For eye protection, safety glasses with side shields are required to be worn when undertaking site activities. If there is a high potential for liquid splashes, goggles must be worn.

3.6 CONFINED SPACES

Entry by personnel working at the Site into confined spaces is not anticipated for the OU-3 RI/FS work and is not authorized under this HASP unless prior clearance from the Project Health and Safety Manager is provided, who will provide instruction in completing a

Confined Space Entry permit, required air monitoring, and other details as required under a Confined Space Entry program.

Confined spaces are defined as a work area or space that is so configured that an employee can bodily enter, is not designed or intended for continuous employee occupancy, and has a limited means of entrance and exit. A confined space provides the potential for poor natural ventilation which may result in possibly high concentrations of contaminants, low oxygen levels, explosive atmospheres, limited visibility, and restricted movement. Confined spaces must be identified with a posted sign that states "Caution - Confined Space" or other similar warning.

3.7 UNANTICIPATED HAZARDS

The following conditions, situations, or activities are not anticipated at this site and, therefore, safety procedures appropriate to them are not included in this Plan. If these items are encountered or discovered, the Site Safety Officer will immediately contact the Project Health and Safety Manager to define a response. Work in this area must stop until a response is received.

- The need to handle, open, sample, or ship drums or containers of hazardous substances (other than investigation derived wastes and the samples to be collected as identified in the Project Work Plan).

- The need to handle, enter, open, sample, or ship tanks or vaults containing hazardous substances.

- Activities requiring personal protective equipment more extensive than Level C as described in Section 5.0.

3.8 GENERAL SAFETY PROCEDURES

The following general safety rules must be followed by project personnel:

- Safety equipment and protective clothing will be worn in Exclusion Zones, in conformance with this Plan and the requirements of 29 CFR 1910.120.

- Unnecessary contact with contaminated surfaces or with surfaces suspected of being contaminated should be avoided.

- Eating, drinking, chewing gum or tobacco, smoking, or such practices that increase the probability of hand-to-mouth transfer and ingestion of material is prohibited in secure or exclusion zones.

- Certain medicines and alcohol can increase the toxic effects of chemicals. Personnel who must be on medication during potential exposure situations must advise the Project Health and Safety Manager prior to beginning work on site. Medical information will be made available to emergency medical personnel in the case of an emergency.

- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or other activities.

- Personnel should shower as soon as possible after the protective clothing is removed and the activity for the day has been terminated.

3.9 ILLUMINATION HAZARDS

Field work in non-illuminated areas should not occur during periods of darkness. If situations require working in the dark, illumination should be provided according to levels specified in Table 3-3 for work areas in 29 CFR 1910.120(m), Table H-102.1. An illumination meter can be purchased or rented for the purpose to measure illumination intensities in specific areas.

3.10 BIOLOGICAL HAZARDS

The potential to encounter various reptiles, insects, and poison ivy in the course of completing the work plan covered by this HASP is considered possible since work will be preformed, in some instances, in or adjacent to vegetated areas. Precautions will be taken by site personnel to avoid prime snake and insect habitats, to protect oneself, and assist other personnel from attack or encounter. (<u>Note</u>: An encounter with a poisonous snake requires immediate professional medical attention.)

Ants, bees, and wasps are considered to be the most common insects that may be encountered. Although their bite is not considered life-threatening, an allergic reaction to these bites could occur. Avoid insect habitats whenever possible.

If bitten by insects, remove the stinger by gently scraping it out (do not use tweezers). Apply ice to the affected area. Instant ice packs are to be kept in the work area. If the worker is bitten by an insect, immediately apply an ice pack to the affected area and wash area with soap, apply antiseptic. If an allergic reaction occurs, transport worker to the closest medical facility for treatment.

3.11 LYME DISEASE PREVENTION

The prevention of Lyme Disease is important during spring, summer and fall months. Lyme Disease is a bacterial infection transmitted by the bite of a deer tick. About 50 percent of deer ticks carry the Lyme Disease bacteria.

To prevent the bite of a deer tick, avoid grassy areas when possible. Wear protective clothing (light colored) with long sleeves and pants tucked inside of socks. Use repellent containing "Permethrin" or "Deet". These repellents should be applied to clothing and not directly on the skin. Make self inspection a habit following exposure to an area which may contain deer ticks.

- Symptoms: headache, flu-like symptoms, a spreading ring-like rash, swelling and pain of the joints.

- Tick Removal: Remove attached tick immediately. Use tweezers to grasp the tick's head, near the skin, and slowly pull straight out. If possible, save the tick for laboratory analysis.

Report incidents involving deer tick bites to the project Health and Safety Manager.

3.12 POISON IVY, OAK AND SUMAC PREVENTION

Poison ivy may be encountered in grassy/wooded areas adjacent to work zones. Precautions include wearing gloves when clearing brush and staying on pathways when possible. Poison ivy, oak, and sumac plants cause contact dermatitis or an allergic reaction in about 90 percent of all adults. To prevent contact wear protective clothing (Tyvek, long sleeves, gloves). Remove clothing without touching the outside of the garments that may have come in contact with the plants.

3.12.1 Signs and Symptoms

- Mild reaction: some itching.
- Mild to moderate reaction: itching and redness.
- Moderate reaction: itching, redness, and swelling.
- Severe: itching, redness, swelling, and blisters.

A day or two is the usual time between contact and the onset of symptoms.

3.12.2 First Aid

Those knowing that they have contacted a poisonous plant should take immediate action within five minutes. The action includes rinsing with brown soap and water or using alcohol. During the acute or weeping and oozing stage, sodium bicarbonate (baking soda) solution should be used.

If symptoms are severe, contact the Project Health and Safety Manager for instructions for treatment by a physician.

3.13 PROCEDURES FOR TEMPERATURE-RELATED PROBLEMS

3.13.1 Heat Related Illness

When coveralls made of Tyvek or Saranex are worn, body ventilation and evaporation are greatly reduced. Frequent breaks will be scheduled for personnel wearing coveralls during hot or humid conditions as noted in the Heat Index Chart in Figure 3-1. Employees will be advised of the effects of heat stress, be provided with adequate drinking water while on site, and be instructed to observe each other for signs of heat stress during hot weather. Acute heat stress signs are summarized in Table 3-4 and below.

- <u>Heat Exhaustion</u> - Acute reaction to heat exposure with symptoms of weakness, dizziness, fainting, nausea, headache, cool and clammy skin, profuse sweating, slurred speech, weak pulse, and dilated pupils.

  First Aid Treatment includes moving patient to a cool place, loosen clothing, and place them in a head-low position.
- <u>Heat Stroke</u> - A life-threatening, dangerous, and acute reaction to heat exposure with failure of the heat-regulating mechanisms of the body. Symptoms include high body temperature, cessation of sweating, dry skin, headache, numbness, tingling, confusion, fast pulse, rapid and loud breathing, convulsion, and unconsciousness leading into coma.

  First Aid Treatment requires the evacuation and removal of the patient to the Support Area, removal of protective clothing, followed by the rapid cool down of the patient in cold water, with the head and shoulders slightly elevated. Heat stroke is a medical emergency. If anyone shows signs of heat stroke, immediately take emergency precautions, contact medical personnel, and transport them to a medical facility as soon as possible (refer to emergency numbers and hospital route in Section 9.4).

These signs can be distinguished from those associated with chemical hazards which are characterized by behavioral changes, breathing difficulties, change in complexion or skin color, coordination difficulties, coughing, dizziness, drooling, diarrhea, fatigue or weakness, and irritability.

3.13.2 Worker Monitoring For Heat Related Illness

Monitoring for heat stress per the current ACGIH guidelines will be implemented when the ambient temperature reaches 70°F (21°C) for workers wearing splash resistant clothing (Tyvek or Saranex coveralls).

To monitor the worker, measure:

- *Heart rate.* Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.
- *Oral temperature.* Use a clinical thermometer (three minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third. Do not allow a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 100.4°F (38°C).
- *Monitor body water loss*, if possible. Measure weight on a scale accurate to ±0.25 pound at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken when wearing similar (or lack of) clothing. *Daily body water loss should not exceed 1.5 percent of total body weight in a single work day*. Also, being thirsty is not a good indicator of potential dehydration.

Fluid replacement should consist primarily of water, fruit juices, and other non-caffeinated beverages. The consumption of alcoholic drinks to replenish lost fluids is ***not*** recommended due to its diuretic effect.

Caution should be exercised when working in hot conditions for the first time or following a prolonged break (such as vacations) until your body becomes acclimatized to the hot conditions. NIOSH recommends a progressive six-day acclimatization period to allow people to become accustomed to hot conditions with only 50 percent workload on the first day and an additional 10 percent added each following day.

The frequency of physiological monitoring depends on the ambient air temperature, solar radiation, wind speed, humidity, acclimatization, and the level of physical work activity. These are reflected in the physiological monitoring for the individual work cycles mentioned in the above paragraphs. When semi-permeable, splash resistant clothing is added, the prevention of heat stress through monitoring and work/rest cycles should begin above temperatures of 70°F as noted below.

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING and WORK/REST CYCLES FOR FIT and ACCLIMATIZED WORKERS[a]

Heat Index Temperature[b]	Normal Work Ensemble[c]	Semi-Permeable Clothing
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

[a] For work levels of 250 kilocalories/hour (light to moderate work level).

[b] Adjust temperature for the effect of sunshine by this equation: Heat Index (ta)°F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

[c] A normal work ensemble consists of cotton coveralls or other cotton long sleeve and pants clothing.

Every effort should be established so that the majority of the work day schedule will be completed before the ambient air temperatures reach their highs for the day. Rotation of personnel into jobs requiring the wearing of semi-permeable clothing is also an effective administrative control to reduce the effects of heat stress.

3.13.3 Cold Related Illness

Factors affecting the potential development of cold weather related symptoms include ambient air temperature, wind speed, ambient humidity, perspiration, contact with surface water or metal, clothing, age, and general health conditions. The wind chill index (Figure 3-2) shows the equivalent temperature on exposed flesh resulting from the combined effects of ambient temperature and wind speed. It should be noted that high humidity conditions and cold temperatures also have the effect of rapidly removing heat from the body.

Cold temperature clothing will be provided to Brown and Caldwell personnel required to work in temperatures below 40°F. This clothing may include insulated coveralls, gloves, boots, wind breakers, and hard hat liners. Outer and inner garments will be selected that allows perspiration to be drawn away from the skin.

Work rate should not be so high as to cause heavy sweating when the wind chill index falls below 10°F. If heavy work must be done, arrangements should be made to provide a heated warming shelter for rest periods. Work should also be arranged to minimize sitting or standing still for long periods of time.

Hypothermia is a general term describing the lowering (cooling) of the body core temperature. Initially, blood flow is restricted to the skin, hands, and feet and conserved for the body core and brain. Stages of hypothermia include shivering (a response that generates heat), apathy, decreased muscle function, decreased level of consciousness, a glassy stare, possible freezing of the extremities, and decreased vital signs with slow pulse and slow respiration rate.

Severe hypothermia results in a rapid decline in the body core temperature and is an acute emergency requiring immediate medical attention. Keep the patient as warm and dry as possible until professional medical attention is available.

Frostbite is the effect of freezing a body part such as the ears, cheeks, nose, fingers, or toes. Symptoms are first noticed as local tingling and redness, followed by paleness and numbness. Initial stages are described as frostnip or incipient frostbite, and characterized by sudden blanching or a whitening of the skin. Superficial frostbite is where the skin has a waxy or white appearance and is firm to the touch, but the tissue beneath is resilient. Deep frostbite, is where the tissues are cold, pale, and solid; this is an extremely serious condition that requires immediate medical attention.

First Aid Treatment of frostbite is to gradually warm up the affected body part. If numbness and/or pain does not subside and if deep frostbite is evident, medical attention should be obtained as soon as possible.

Prevention of frostbite can be accomplished through the replacement of wet clothing with dry clothing, drinking of warm fluids in the Support Zone, and frequent warm-up breaks.

Work will be suspended during any weather conditions that are sufficiently extreme to potentially affect the adequacy of the HASP or the integrity of equipment, such as heavy rains, heavy snow fall, electrical storms, or extreme heat or cold. The Site Safety Officer is responsible for determining when to suspend work.

TABLE 3-1

WORK ACTIVITIES, POTENTIAL HAZARDS, AND CONTROL MEASURES FOR OU-3
Cornell-Dubilier Electronics Superfund Site, South Plainfield, New Jersey

OPERATOR TASK	POTENTIAL HAZARDS	PROTECTIVE MEASURES
1. Well Drilling/Installation	Inhalation of or direct contact with contaminants; noise; injury from drilling rig or other equipment; weather related exposure; slips, trips and falls; electrical hazards; underground utilities	Modified Level D PPE; air monitoring; trained operators; caution in vicinity of equipment; heat/cold stress training; removal of debris; minimum safe distance from power lines; markout of underground utilities
2. Aquifer Testing	Inhalation of or direct contact with contaminants; weather related exposure; lifting stresses; slips, trips and falls; electrical hazards	Modified Level D PPE; air monitoring; heat/cold stress training; training in proper lifting procedures; removal of debris; use of ground fault interrupters
3. Groundwater Sampling	Inhalation of or direct contact with contaminants; weather related exposure; lifting stresses; slips, trips and falls; electrical hazards	Modified Level D PPE; air monitoring; heat/cold stress training; training in proper lifting procedures; removal of debris; use of ground fault interrupters
4. Water Level Monitoring	Inhalation of or direct contact with contaminants; weather related exposure; working near open water; slips, trips and falls	Modified Level D PPE; air monitoring; heat/cold stress training; buddy system; removal of debris
5. Vapor Intrusion Testing	Inhalation of or direct contact with contaminants; weather related exposure; slips, trips and falls	Modified Level D PPE; air monitoring; heat/cold stress training; removal of debris
6. Investigation Derived Waste Handling and Sampling	Inhalation of or direct contact with contaminants; lifting stresses; weather related exposure; slips, trips and falls	Modified Level D PPE; air monitoring; heat/cold stress training; training in proper lifting procedures; removal of debris

Table 3-2
Constituents of Interest and Occupational Exposure Limits
Cornell-Dubilier Electronics Superfund Site

Compound	CAS No. (a)	1993 OSHA PEL (TWA) (b)	NIOSH REL (TWA) (b)	NIOSH REL (STEL) (b)	1995 NIOSH IDLH (b)	Vapor Pressure mm Hg
Volatile Organics (VOCs)						
Carbon Tetrachloride*	56-23-5	10 ppm	Ca[c]	2 ppm (60 min)	Ca (200 ppm)	91
Chloroform*	67-66-3	50 ppm[d]	Ca[c]	2 ppm (60 min)	Ca (500 ppm)	160
1,1-Dichloroethene*	75-35-4	none	Ca[c]	none	Ca (ND)	182
Cis-1,2-Dichloroethylene	540-59-0	200 ppm	200 ppm	none	1000 ppm	180-265
Methyl Tertiary Butyl Ether (MTBE)*	1634-04-4	ND	ND	ND	ND	245
Tetrachloroethene (PCE)	127-18-4	100 ppm	Ca[c]	none	Ca (150 ppm)	14
1,2,4-Trichlorobenzene	120-82-1	none	none	C = 5 ppm[d]	ND	1
1,1,1-Trichloroethane*	71-55-6	350 ppm	none	C = 350 ppm[d]	700	100
Trichloroethene (TCE)	79-01-6	100 ppm	Ca[c] - 25 ppm	none	Ca (1000 ppm)	58
Toluene*	108-88-3	200 ppm	100 ppm	150 ppm	500 ppm	21
Vinyl Chloride	75-01-4	1 ppm	Ca[c]	none	Ca (ND)	3.3 atm
Semi-Volatile Organics (SVOCs)						
Bis(2-Ethylhexyl) phthalate	117-81-7	5 mg/m^3	Ca[c] 5 mg/m^3	Ca[c] 10 mg/m^3	Ca (5000 mg/m^3)	< 0.01
Naphthalene	91-20-3	10 ppm	10 ppm	15 ppm	250 ppm	0.08
Pesticides and PCBs						
Aldrin	309-00-2	0.25 mg/m^3	0.25 mg/m^3	none	Ca (0.25 mg/m^3)	0.00008
beta-BHC	319-85-7	ND	ND	ND	ND	
delta-BHC	319-86-8	ND	ND	ND	ND	
PCB - Arochlor 1232	11141-16-5	1 mg/m^3	Ca (0.001 mg/m^3)	none	none	<0.1
PCB - Arochlor 1254	11097-69-1	0.5 mg/m^3 (skin)[e]	Ca (0.001 mg/m^3)	none	Ca (5 mg/m^3)	0.00006

Note:
mg/m^3: concentration expressed in milligrams of substance per cubic meter of air
ppm: concentration expressed in parts per million on a volume basis
*Compound found in off-site wells only
(a) Chemical Abstracts Service Identification Number
(b) From the "NIOSH Pocket Guide to Chemical Hazards", September 2005:
TWA - Time Weighted Average (8 hour day, 40 hour week);
STEL - Short Term Exposure Limit; 15 minute duration of exposure not to be exceeded any time during the day without respiratory protection;
IDLH - Immediately Dangerous to Life and Health: Ca - potential occupational carcinogen.
The 1993 Permissable Exposure Limit (PEL) is established by the Occupational Safety and Health Administration (OSHA) and found in the OSHA General Industry Air Contaminants Standard (29 CFR 1910.1000). The Recommended Exposure Limit (REL) and IDLH are established by the National Institute for Occupational Safety and Health (NIOSH).
(c) Carcinogen
(d) Ceiling value - should not be exceeded at any time
(e) Skin desgnation indicates the potential for dermal absorption
NA: Not Aplicable
ND: Not Developed

TABLE 3-3

MINIMUM ILLUMINATION INTENSITIES IN FOOT-CANDLES 29 CFR 1910.120 (m). Table H-102.1

Foot-Candles	Area or Operation
5	General site areas.
3	Excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: warehouses, corridors, hallways, and exitways.
10	General shops (mechanical and electrical equipment rooms, active storerooms, barracks or living quarters, locker or dressing rooms, dining areas, and indoor toilets and workrooms).
30	First aid stations, infirmaries, and offices

Table 3-4

COMPARISON OF HEAT STROKE AND HEAT EXHAUSTION

	Heat Stroke (911 – Medical Emergency)		Heat Exhaustion	
Definition:	A condition or derangement of the heat-control centers due to exposure to the rays of the sun or very high temperatures. Loss of heat is inadequate or absent.		A state of very define weakness produced by the excess loss of normal fluids and sodium chloride in the form of sweat.	
History:	Exposure to sun or extreme heat.		Exposure to heat; person usually works indoors.	
Differential Symptoms:	**Face:**	Red, dry and hot	**Face:**	Pale, cool and moist
	Skin:	Hot, dry and no sweating	**Skin:**	Cool, clammy, with profuse sweating
	Temperature:	High, 106°F to 110°F (41.1°C to 43.3°C)	**Temperature:**	Subnormal
	Pulse:	Full, strong, bounding	**Pulse:**	Weak, thready, and rapid
	Respiration:	Audible, labored, difficult, loud	**Respiration:**	Shallow and quiet
	Muscles:	Tense and possible convulsions	**Muscles:**	Tense and contracted
	Eyes:	Pupils are dilated, but equal	**Eyes:**	Pupils are normal; eyeballs may be soft
Treatment:	Absolute with head elevated; keep body cool by any means available until hospitalized, but do not use alcohol applied to skin. Take temperature every 10 minutes, and do not allow it to fall below 101°F (38.5°C).		Keep patient quiet; head should be lowered; keep body warm to prevent onset of shock.	
	Drugs:	Allow no stimulants; give infusions of normal saline (to force fluids).	**Drugs:**	Salty fluids and fruit juices should be given frequently in small amounts. Intravenous isotonic saline will be required if patient is unconscious.

Source: Taber's Cyclopedic Medical Dictionary, 17th Edition, 1993

Figure 3-1. Heat Index Chart

Temperature (F) versus Relative Humidity (%)

°F	90%	80%	70%	60%	50%	40%	30%	20%	10%
65	65.6	64.7	63.8	62.8	61.9	60.9	60.	59.1	58.1
70	71.6	70.7	69.8	68.8	67.9	66.9	66.	65.1	64.1
75	79.7	76.7	75.8	74.8	73.9	72.9	72.	71.1	70.1
80	88.2	85.9	84.2	82.8	81.6	80.4	79.	77.4	76.1
85	101.4	97.	93.3	90.3	87.7	85.5	83.5	81.6	79.6
90	[illegible]	[illegible]	[illegible]	100.5	96.1	92.3	89.2	86.5	84.2
95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.9	96.1	92.2	89.2
100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	104.2	98.7	94.4
105	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.
110	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
115	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

HI	**Possible Heat Disorder:**
80°F - 90°F	Fatigue possible with prolonged exposure and physical activity.
90°F - 105°F	Sunstroke, heat cramps and heat exhaustion possible.
105°F - 130°F	Sunstroke, heat cramps, and heat exhaustion likely, and heat stroke possible.
130°F or greater	Heat stroke highly likely with continued exposure.

Below is a table comparing Temperature and Dewpoint, with the same disorders possible:

Temperature (Down) versus Dewpoint (across)

°F	50	55	60	65	70	75	80	85
65	62.7	63.8	65.0	66.6				
70	67.8	68.7	69.8	71.1	72.6			
75	73.1	73.9	74.8	75.9	79.2	80.7		
80	79.8	80.6	81.6	82.8	84.4	86.9	90.9	
85	83.5	84.7	86.1	88.0	90.5	94	99	[illegible]
90	87.9	89.4	91.2	93.6	96.9	101.2	[illegible]	[illegible]
95	92.9	94.5	96.7	99.6	103.4	[illegible]	[illegible]	[illegible]
100	98.1	99.9	102.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
105	103.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
110	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Figure 3-2

Wind Chill Chart

Temperature (°F)

Wind (mph) / Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

SECTION 4

PERSONNEL TRAINING REQUIREMENTS

4.1 TRAINING

Personnel working in an Secure Zone will have forty (40) hours of documented training pursuant to OSHA 29 CFR 1910.120(e). In addition, each individual as appropriate, will have received in the past year, eight (8) hours of documented annual refresher training. Supervisory personnel will also have received at least eight (8) additional hours of supervisory training. Documentation of classroom training and alternative training experience will be made available upon request by the Project Health and Safety Manager for contractors' personnel.

This site HASP will be made available prior to the start of subcontractors field activities. A pre-operation meeting will be held to discuss the contents of the Plan. Specialty training will be provided as needed based on task and responsibility. Site-specific contractor training will be conducted under direct supervision of the Contractor Health and Safety Manager or their designee and training documentation provided upon request.

4.2 TRAINING AND BRIEFING TOPICS FOR SITE ACTIVITIES

Pre-entry briefings will be held by the Site Safety Officer prior to initiating any contractor site activity, at other times as necessary so that employees are apprised of the this HASP, and that this Plan is being followed. Prior to beginning new site activities, personnel will attend a task-specific Health and Safety orientation. The purposes of this orientation will be to familiarize project personnel with task-specific hazards, to promote compliance with the HASP, and to fulfill Hazard Communication regulations. These topics will be discussed by the Site Safety Officer during the work start-up orientation:

- Description of chemical and physical hazards
- Medical surveillance and training requirements
- Levels of protection, including respiratory protection, if required
- Site control measures and work zones
- Health and safety chain-of-command
- Hospital directions, emergency procedures, and telephone numbers
- Reporting of injuries and illnesses
- Task-specific activities previously found in "Work Activities, Potential Hazards, and Control Measures for OU-3" (Table 3-1).

Personnel who will be working in the Exclusion Zone will attend the work start-up briefing and complete the "Acknowledgment" form (Figure 2-1) attesting to their review of the HASP and attendance at the work start-up briefing. Additional training may occur on a daily basis relative to planned tasks and may also occur as events or circumstances arise that require revision of the HASP.

Exemptions from training are subject to the review and approval of the Project Health and Safety Manager and will be noted in the site Health and Safety Logbook.

SECTION 5

PERSONAL PROTECTIVE EQUIPMENT TO BE USED

5.1 PERSONAL PROTECTION

Use of personal protective equipment (PPE) is a major means to minimize potential exposure. The levels of protection for personnel have been based on OSHA Guidelines for the compounds of concern, the U.S. Environmental Protection Agency (EPA) Occupational Health and Safety Manual, and the Hazardous Substances Data Bank of the National Library of Medicine.

Personnel working in the Secure Zone will have their own personal safety equipment and protective clothing, which will be used according to the direction of the Site Safety Officer. Non-disposable PPE will be kept clean and maintained. Personnel will be trained in the use and maintenance of PPE and will be properly fitted prior to beginning site activities.

Appropriate site controls and personal protective equipment (PPE) will be utilized to reduce potential chemical exposure. It is expected that normal work activities to be conducted under this HASP would result in personnel exposures below the current occupational exposure limits. Therefore, no special engineering controls or extraordinary work practices are deemed necessary at this time.

5.2 LEVELS OF PERSONAL PROTECTION

The levels of personal protection expected to be used are summarized in Table 5-1. Modified Level D will be the minimum level of protection for personnel conducting activities within a Secure Zone; e.g., drilling activities. Modified Level D consists of:

- Hard hat
- Hearing protection for drilling activities or as needed
- Safety Glasses w/ splash protection
- Tyvek coveralls for certain activities as determined by SSO
- Safety Shoes w/ disposable boot covers as needed or as determined by SSO

Breathing zone air monitoring will be performed with an Hnu/OVA meter and a combustible gas/oxygen indicator. When on site, Draeger tube readings will be taken for Vinyl chloride if the HNu/OVA reading exceeds 1 ppm above the background concentration. Depending on the change in activity being performed, for continued readings above 1 ppm, Draeger tube readings for Vinyl chloride will be taken every 1 to 2 hours. Personnel working in the Secure Zone will continue to wear Modified Level D PPE as long as the OVA/HNu reads greater than 1 ppm but the individual Draeger tube measurements for Vinyl chloride are below the PEL of 1 ppm. For off-site activities, if the HNu/OVA reading exceeds 1 ppm above the background concentration, Draeger tube readings will also be taken for Carbon Tetrachloride and Chloroform, in addition to Vinyl Chloride. Modified Level D PPE can continue to be utilized for Draeger tube measurements below the PEL of 2 ppm for both Carbon Tetrachloride and Chloroform. Off-site, for continued readings above 1 ppm, Draeger tube readings will be taken every hour.

Level C defines the protection required when at least 10 ppm above background is indicated by the OVA/HNu in the breathing zone over a five-minute period or Draeger tube readings exceed the PEL for Vinyl chloride of 1 ppm, or if off-site, exceed the PEL of 2 ppm for Carbon Tetrachloride or Chloroform. Level C consists of Modified Level D plus a full-face supplied-air respirator or self-contained breathing apparatus. If Vinyl chloride exceeds its PEL, a chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 ppm may be utilized. Venting of the area may be an engineering control that would be implemented to bring air monitoring measurements into Modified Level D operating conditions. Should dust be visible while working on-site, Modified Level C with a respirator and P-100 particulate cartridges will be utilized until dust is mitigated through implementation of a dust suppressant (e.g. water) or diminishes.

Unusual reports of odor should be investigated thoroughly. Should monitoring equipment show ambient air levels above background under circumstances of unusual odors, personnel will evacuate until the Project Health and Safety Officer is contacted and provisions are made to re-enter the area.

See Section 7.1 for additional details concerning continuous air monitoring with a combustible gas/oxygen monitor used to measure the percentage of the combustible gas/oxygen present in the breathing zone, and Section 7.2 for details concerning air monitoring action levels for the Community Air Monitoring Plan.

5.3 CHEMICAL RESISTANCE / INTEGRITY OF PROTECTIVE MATERIAL

Generic clothing materials in Table 5-2 and in Table B-5 in Appendix B have been matched with various chemical classes that may be encountered during the performance of tasks covered under this HASP. Additional information regarding the integrity and limitations of personal protective equipment can be found in the publication *Quick Selection*

Guide to Chemical Protective Clothing (K. Forsberg, S.Z. Mansdorf, 2003). Should compounds be encountered on site that have not been identified by this HASP or are not printed within the Guide, the Project Health and Safety Manager must be contacted.

5.4 INSPECTION OF PROTECTIVE EQUIPMENT

The proper inspection of PPE features several sequences of inspection depending upon the specific articles of PPE and frequency of use. The different levels of inspection are as follows:

- Inspection and operational testing after receiving equipment from the factory, supplier, or distributor.
- Inspection of equipment when issued to workers.
- Inspection after use, training demonstrations, or following maintenance.
- Periodic inspection of stored equipment.
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

The primary inspection of PPE for activities will occur prior to immediate use and will be performed by the user so that the specific device or article has been checked out by the user, and the user is familiar with its use. Table 5-3 is a PPE Inspection Checklist that should be referenced before, during, and after use of personal protective equipment.

5.5 SPECIFIC LEVELS OF PROTECTION PLANNED FOR THE SITE

Modified Level D of protection will be utilized during activities at the site unless air monitoring indicates a higher level of PPE is required (see Table 5-1). Personal protective equipment will be stored in a clean, dry area until it is used.

TABLE 5-1

ACTION LEVELS FOR UPGRADING PERSONAL PROTECTIVE EQUIPMENT

Level	Level Application
MODIFIED LEVEL D[1]	
• Work uniform with long pants • Tyvek® coveralls[a] • Chemical resistant gloves (Nitrile) • Steel toe boots w/ disposable boot covers • Safety glasses with side shields • Hard hat and hearing protection as required • Breathing zone air monitoring with an11.7 eV HNU or OVA; and a combustible gas/oxygen indicator • Colorimetric Detector Pump and Tubes	• Breathing zone HNU/OVA reading less than 5 ppm above background level for more than five minutes, and, • Colorimetric tubes do not indicate the presence of vinyl chloride (on or off-site) above 1 ppm, or carbon tetrachloride or chloroform (off-site) above 2 ppm.
LEVEL C[1]	
Modified Level D plus: • Tyvek®/Saranex® coveralls with hood • Full face supplied-air respirators or self-contained breathing apparatus; for vinyl chloride – any chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 ppm. • For dust/particulates only - respirator with a P-100 particulate cartridge • Breathing zone air monitoring with an 11.7 eV HNU or OVA and a combustible gas/oxygen indicator • Colorimetric Detector Pump and Tubes	• Breathing zone HNU/OVA readings in excess of 10 ppm over the background level for more than five minutes, or, • Colorimetric tubes indicate the presence of vinyl chloride above 1 ppm or carbon tetrachloride or chloroform above 2 ppm

1. Cotton gloves and undergarments are recommended to be worn to provide for perspiration absorption which serves as a cooling device for the body.

[a]Tyvek® coveralls to be used during specified sampling or drilling operations.

Table 5-2

CHEMICAL PROTECTION OF CLOTHING MATERIALS
BY GENERIC CLASS

Generic Class	Butyl Rubber	Polyvinyl Chloride	Neoprene	Natural Rubber
Alcohols	E	E	E	E
Aldehydes	E-G	G-F	E-G	E-F
Amines	E-F	G-F	E-G	G-F
Esters	G-F	*P*	G	F-*P*
Fuels	F-*P*	G-*P*	E-G	F-*P*
Halogenated Hydrocarbons	G-*P*	G-*P*	G-F	F-*P*
Hydrocarbons	F-*P*	F	G-F	F-*P*
Inorganic Acids	G-F	E	E-G	F-*P*
Inorganic Bases and Salts	E	E	E	E
Ketones	E	*P*	G-F	E-F
Natural Fats and Oils	G-F	G	E-G	G-F
Organic Acids	E	E	E	E

Legend: E - Excellent
G - Good
F - Fair
P - Poor

Source: *Survey of Personnel Protective Clothing and Respiratory Apparata*, September 1974, DOT, USCG, Office of Research and Development

TABLE 5-3
SAMPLE PPE INSPECTION CHECKLIST

Clothing

Before use:	Determine that the clothing material is correct for the specified task at hand.
Visually inspect for:	• Imperfect seams; • Nonuniform coatings; • Tears; and • Malfunctioning closures.
Hold up to light and check for pinholes	
Flex product:	• Observe for cracks. • Observe for other signs or shelf deterioration.
If the product has been used previously, inspect inside and out for signs of chemical attack:	• Discoloration • Swelling • Stiffness
During the work task, periodically inspect for:	• Evidence of chemical attack such as discoloration, swelling, stiffening and softening. • Keep in mind, however, that chemical permeation can occur without any visible effects. • Closure failure • Tears • Punctures • Seam discontinuities

Gloves

Before use:	Pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet towards fingers or inflate glove and hold under water. In either case, no air should escape.

Fully Encapsulating Suits

Before use:	• Check the operation of pressure relief valves
	• Inspect the fitting of wrists, ankles, and neck
	• Check faceshield, if so equipped, for:
	  - cracks
	  - crazing
	  - fogginess

TABLE 5-3
SAMPLE PPE INSPECTION CHECKLIST

Clothing

Before use:	Determine that the clothing material is correct for the specified task at hand.
Visually inspect for:	• Imperfect seams; • Nonuniform coatings; • Tears; and • Malfunctioning closures.
Hold up to light and check for pinholes	
Flex product:	• Observe for cracks. • Observe for other signs or shelf deterioration.
If the product has been used previously, inspect inside and out for signs of chemical attack:	• Discoloration • Swelling • Stiffness
During the work task, periodically inspect for:	• Evidence of chemical attack such as discoloration, swelling, stiffening and softening. • Keep in mind, however, that chemical permeation can occur without any visible effects. • Closure failure • Tears • Punctures • Seam discontinuities

Gloves

Before use:	Pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet towards fingers or inflate glove and hold under water. In either case, no air should escape.

Fully Encapsulating Suits

Before use:	• Check the operation of pressure relief valves
	• Inspect the fitting of wrists, ankles, and neck
	• Check faceshield, if so equipped, for:
	  - cracks
	  - crazing
	  - fogginess

SECTION 6

MEDICAL SURVEILLANCE REQUIREMENTS

6.1 GENERAL OSHA REQUIREMENTS

OSHA has established requirements for a medical surveillance program designed to monitor and reduce health risks for employees potentially exposed to hazardous wastes covered under the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard 29 CFR 1910.120(f). Employees are required by federal regulations to have medical monitoring if they are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits, without regard to the use of respirators, for 30 days or more a year.

This program has been designed to provide baseline medical data for each employee involved in hazardous waste operations and to determine his/her ability to wear personal protective equipment, such as chemical resistant clothing and respirators. Employees who wear or may wear respiratory protection must be provided respirators as regulated by 29 CFR 1910.134. This Standard requires that an individual's ability to wear respiratory protection be medically certified before he/she performs designated duties. Where medical requirements of 29 CFR 1910.120(f) overlap those of 29 CFR 1910.134, the more stringent of the two will be enforced.

The medical examinations will be administered on a pre-employment and annual or biannual basis, as warranted in the opinion of examining doctor by symptoms of exposure or specialized activities. These examinations will also be provided to employees upon termination of employment or reassignment to non-hazardous waste site activities. For the purposes of this HASP, all contractors will assume the employer's responsibility in obtaining the necessary medical monitoring for their employees and provide compliance documentation upon request.

6.2 MEDICAL EXAMINATIONS

Periodic medical examinations will be provided to personnel covered under the HAZWOPER standard and will be conducted within the past 12 months by a licensed physician, or a lesser frequency as appropriate based on regulatory requirements. This time period may also be lengthened or shortened under the recommendations of the physician. The physician will keep permanent records of examinations and maintain this documentation in a central file which will be available upon request from authorized personnel.

Medical monitoring should meet or exceed regulatory compliance issues pursuant to OSHA 29 CFR 1910.94, .120, .134 and .1001 through .1050. Included within these regulatory issues are the determination by a physician that an individual being examined is physically able to use an air-purifying respirator and is able to perform the work within the specific job description. The capability of an individual to perform the specified work will be determined from examinations that will include:

- Detailed medical and work histories
- Physical examination with special attention to target organ systems
- Pulmonary function test (FVC and FEV1)
- Chest x-ray every three years (earlier if required by a physician)
- ECG (Electrocardiogram)
- Eye examination and visual acuity screening
- Audiometry
- Urinalysis
- Blood chemistry (hematology, serum analyses, heavy metals toxicology).

When necessary, additional testing may be performed at the discretion of the examining physician to determine fitness for duty, to comply with other OSHA standards, or other mandated requirements. The physician should discuss the findings of the exam and test results with the employee, including non-occupational issues related to personal lifestyle or dietary choices.

6.3 EXPOSURE/INJURY/MEDICAL SUPPORT

Personnel covered by this HASP must report injuries and exposures and are encouraged to seek medical attention and physical testing following an injury or possible exposure above established exposure levels.

SECTION 7

FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING

The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of personal protection required and for community safety. Initial screening for identification is generally qualitative. Subsequent testing is typically required to quantify concentrations. Continuous air monitoring will be used in secure areas to identify airborne contaminants using direct reading instruments: e.g., HNu/OVA and combustible gas/oxygen monitor.

7.1 CONTINUOUS AIR MONITORING

Continuous air monitoring will be conducted at each Secure Zone using the HNu (with an 11.7 eV lamp)/OVA and Draeger tubes, as described in Section 5.2 and contained in Table 5-1. Background HNu/OVA readings will be obtained once each morning after calibration and following lunch. The background reading will be taken in an area removed and upwind of the work site.

During well construction activities, a combustible gas/oxygen monitor will be used to measure the percentage of the combustible gas/oxygen present in the breathing zone. A sustained indication of combustible gas at 10 percent of the lower explosive limit or more for one minute, will cause work to cease immediately and personnel will be evacuated to a safe area until provisions can be made to reduce the 10 percent LEL. Oxygen levels below 19.5 percent will require a self-contained breathing apparatus (SCBA). Above 25 percent oxygen, activities will be suspended because of fire hazard.

Specification sheets for the monitoring equipment will be maintained within their shipping or storage containers. Included will be methods for calibration, operation, troubleshooting, and minor repair. Availability of the specification sheets will be monitored by the Site Safety Officer. Deficiencies or operating problems with monitoring equipment will be made known to the Project Health and Safety Officer. Continuous monitoring equipment will be serviced and batteries placed on charge, as they are required. A maintenance log will be maintained for monitoring equipment and any major discrepancy or operating malfunction must be brought to the attention of the Project Health and Safety Officer within 24 hours.

7.2 COMMUNITY AIR MONITORING PLAN

It may be necessary to provide real-time air monitoring, for volatile organic compounds at the work area perimeter in order to protect the surrounding community. The plan includes the following:

- If organic vapor levels in the work area exceed Modified Level D requirements from Section 5.2 and Table 5-1, volatile organic compounds must then be continuously monitored at the downwind perimeter of the Exclusion Zone. If total organic vapor levels exceed Modified Level D requirements, in the downwind direction of the Exclusion Zone, work activities must be halted, and monitoring continued under the provisions of a Vapor Emission Response Plan.

7.2.1 Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds Modified Level D requirements at the downwind boundary of the Exclusion Zone, monitoring will commence at the downwind boundary of the Secure Zone. If sustainable measurements over 5 ppm above background are read at the downwind boundary of the Secure Zone or colorimetric tubes indicate the presence of vinyl chloride, carbon tetrachloride or chloroform above PELs, activities will be suspended pending evaluation and revision of the work activities. At this point the Project Manager, Project Health and Safety Manager, and Site Safety Officer should be consulted prior to recommencing work activities.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shut down. When work shutdown occurs, downwind air monitoring as directed by the Site Safety Officer will be implemented so that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

7.2.2 Major Vapor Emission

If, following the cessation of the work activities, or as the result of an emergency, organic levels at the downwind boundary of the Secure Zone persist above Modified Level D requirements, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20-Foot Zone).

If efforts to abate the emission source are unsuccessful and vapor levels above Modified Level D requirements persist for more than 30 minutes in the 20-Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect.

However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels at the downwind boundary of the Secure Zone are greater than 10 ppm above background.

7.2.3 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

1. Frequent air monitoring will be conducted at 30-minute intervals within the 20-Foot Zone.

2. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Site Safety Officer. If readings are found above action levels, then Emergency Response Contacts as listed in the HASP will go into effect. The local police authorities will immediately be contacted by the Site Safety Officer and advised of the situation.

SECTION 8

SITE CONTROL MEASURES

8.1 GENERAL

Standard work practices and engineering controls can be used to control hazards. For instance, particulate dust can be suppressed by utilizing water sprays or covering materials such as burlap. When the control procedures prove to be inadequate to for worker safety, appropriate personal protective equipment must be worn if exposures exceed the permissible exposure limits.

Activities that can potentially bring workers in contact with organic vapors will be monitored with either a photoionization detector (PID) or other direct reading instruments capable of responding to compounds or substances listed in Table 3-2. Activities in areas known to contain dust hazards should be monitored for airborne particulate levels.

Posted speed limits shall be observed and personal vehicles will remain on paved surfaces.

8.2 SITE SECURITY AND SITE ACCESS

Access into Secure Zones will be established at a 50-foot radius and indicated by one or more visible surface devices such as barriers, high visibility tape, or fencing. The Site Safety Officer will check the integrity of the secured areas throughout the work day. Planned activities requiring personnel access to a Secure Zone will be coordinated with the Site Safety Officer. Should access control be required during the night time hours, the Site Safety Officer, will arrange for security. Personnel entering the work zone are required to acknowledge reading of the HASP previously noted as Figure 2-1, to sign the visitor entry/exit log previously noted as Figure 2-2, and to adhere to the Plan requirements while in the vicinity.

Visitors to the work site must provide their own NIOSH-approved safety equipment meeting the requirements of this HASP or they will be denied entry and access to the work site.

8.3 SITE COMMUNICATION

Successful communications between field teams and contact with personnel in the Support Zone is essential. The following communication systems will be available within Secure Zones:

- Normal verbal communication, which can include 2-way radios
- Hand signals for Level B and C are as follows:

Signal	Definition
Hands clutching throat	Out of air / cannot breath
Hands on top of head	Need assistance
Thumbs up	OK / I am all right / I understand
Thumbs down	No / Negative
Arms waving upright	Send backup support
Grip partners wrist	Exit area immediately

Personnel typically have access to a mobile cellular telephone that is present in the work area or carried in their vehicle.

8.4 DECONTAMINATION PROCEDURES

Decontamination is the physical process of removal of contaminants or potential contaminants from personnel and equipment before leaving the work site. At this site, decontamination will primarily consist of the collection of materials into containers at decontamination stations established within Secure Zones designated by the Site Safety Officer. Those items for disposal will be collected in a plastic-lined container and disposed of in a proper manner. MSDSs will be kept on site for chemicals (Table 8-1) used in the decontamination process.

Personnel involved in decontamination operations will be required to wear a splash-resistant coverall or apron, safety glasses, and rubber gloves for this task. Personnel decontamination will primarily consist of the removal of outer protective clothing and placement into containers. Following removal of outer protective clothing, personnel will be encouraged to shower as soon as possible and change into clean clothing.

8.5 LEVELS OF DECONTAMINATION REQUIRED FOR PERSONNEL

Modified Level (D) PPE will typically be worn during site activities. Higher levels of protective clothing could be required depending on the results of air monitoring. A decontamination area will be established in each Secure Zone for both personnel and equipment. The Modified Level D decontamination procedure will be:

- Step 1 - Removal of outer boots (if applicable).
- Step 2 - Removal of outer gloves (if applicable)
- Step 3 - Removal of Tyvek clothing
- Step 4 - Removal of inner gloves

Note: The use of outer gloves is not required under this HASP.

In an emergency, the primary concern is to prevent the loss of life or severe injury to site personnel. Should immediate medical attention be required to save a life, decontamination shall be delayed until the victim is stabilized. However, if decontamination can be performed without interfering with first aid or life saving techniques, or should a worker be contaminated with an extremely toxic or corrosive material that has the potential to cause severe injury or loss of life, decontamination must be performed immediately. If an emergency due to heat-related illness develops, protective clothing shall be removed from the individual to reduce heat stress. During an emergency, provisions shall also be made for protecting medical personnel and disposing of contaminated clothing and equipment. Additional detailed decontamination information is contained in Appendix B.

Table 8-1

LIST OF CHEMICALS TO BE BROUGHT TO THE SITE

Acetone (Decontamination)

Nitric Acid (Decontamination)

Methanol (Decontamination, Extraction)

SECTION 9

EMERGENCY/DISASTER CONTINGENCY PLAN

9.1 PRE-EMERGENCY PLANNING

This section will be reviewed with project personnel along with the HASP before the project start-up in order to identify the potentially hazardous conditions that may be associated with specific task activities. The Emergency/Disaster Contingency Plan will be reviewed and revised as necessary by the Site Safety Officer.

9.2 PERSONNEL ROLES AND LINES OF AUTHORITY

The Site Safety Officer has the primary responsibility for coordinating response to emergencies on the project site. It is the responsibility of *anyone* observing an emergency situation to notify the Site Safety Officer. In case the Site Safety Officer cannot be reached immediately, the person observing the emergency can contact the appropriate emergency service (Table 9-1).

9.3 MEDICAL ASSISTANCE/EMERGENCY CONTACTS

In the event of personnel exposure, accident, injury, or fire at the work site, the following general accident and emergency response procedures are to be followed by personnel working under this HASP.

Should an emergency requiring evacuation (subsequent to a decision by the Site Safety Officer) occur, personnel will evacuate the area to a location established by the Site Safety Officer. These locations will be sited upwind of the predominant wind flow and be designated on a daily basis to reflect the daily wind direction. Designated locations will be situated away from the area in which the emergency occurred and be identified during the initial site safety briefing and as work locations change. Following the evacuation, the Site Safety Officer will initiate a head count to check that personnel who entered the work site have successfully been evacuated. Discrepancies will be brought to the immediate attention of the Site Coordinator and/or the responding emergency service(s). The Site Safety Officer will also be responsible for assessing the presence of any other individuals downwind of the area of the emergency and the need for evacuation of those individuals as well.

The Site Safety Officer should notify the Project Director and the Project Health and Safety Manager as soon as possible, and explain that an emergency incident has or is occurring. Individuals should contact the appropriate persons noted in Table 9-1.

Activities that may require outside responsive actions to mitigate an emergency situation will be handled by the Site Safety Officer.

9.4 MEDICAL EMERGENCY RESPONSE

The closest medical emergency center to the Cornell-Dubilier Electronics Site and surrounding work area is Muhlenberg Hospital at 1200 Randolph Rd., Plainfield, NJ 07060.(Figure 9-1). This medical emergency center can be reached by heading southwest from the site entrance and turning right at Lakeview Ave., followed by another right turn onto Maple Ave., a left turn onto Park Ave., and right turn onto Randolph Road. The hospital is located on the right.

9.5 EMERGENCY RECOGNITION AND PREVENTION

Section 3.0 provided a listing of chemical and physical hazards that may be encountered. Typical hazards as a direct result of site activities are listed in Table 9-2 with suggested prevention and control techniques/mechanisms noted. Table 9-3 provides a review of general evacuation procedures and safe distances in the event of a major incident. Personnel working in Secure Zones will be familiar with the techniques of hazard recognition from preassignment training and from site-specific briefings. The Site Safety Officer is responsible for making preventive devices and equipment available to Secure Zone personnel.

9.6 EVACUATION ROUTES AND PROCEDURES

Should an emergency requiring evacuation occur, personnel will evacuate the area to a location pre-established by the Site Safety Officer. These locations will be selected, marked and will be at least 250 feet upwind of the Secure Zone. Following the evacuation, the Site Safety Officer will initiate a head count to check that personnel who entered the Secure Zone have successfully been evacuated.

In the event of an emergency which necessitates an evacuation of the Secure Zone, the following alarm procedure will be implemented:

- <u>Three loud horn blasts</u> - personnel will be expected to proceed to the designated evacuation area and will remain in the area until a re-entry to the Secure Zone is authorized.

9.7 INCIDENT REPORTING

Following an accident or incident, an incident report will be completed by a responsible individual at the scene (refer to Incident/Accident Report, Figure 9-2). Information in the incident report will include the following items:

- Name(s) of individuals involved or witnesses
- Date and time
- Exact location
- Description of incident
- Type of exposure suspected or nature of injury
- Nature of emergency response actions
- Corrective measures taken to prevent repeat of the incident

Incident reports will be filed with the Project Coordinator and Project Health and Safety Manager as soon as practical and a written report filed within 24 hours of the incident.

Further, in the event of a hazardous material spill or chemical release above the reportable quantity, the appropriate Federal and State agencies will be notified. Notification will be made from the Site Safety Officer to the Project Coordinator who in turn will report the incident to the appropriate regulatory agency.

9.8 EMERGENCY MEDICAL TREATMENT PROCEDURES

At least one individual present on the site must have current First Aid and Cardio-Pulmonary Resuscitation (CPR) training. This person or persons will be identified by the Site Safety Officer prior to work activities. Personnel with minor injuries can be treated on site. In the event of a serious injury, the person will be stabilized and the South Plainfield Fire Department will be called on to transport them. Accidents must be reported to the Project Health and Safety Manager.

An individual who becomes ill or is injured while working within the Exclusion Zone must be decontaminated to the maximum extent possible. Should the injury or illness be minor in nature, a full decontamination of personnel will be administered prior to transport to a medical facility. If the individual's condition is serious, a quick decontamination of the person should be completed (i.e., complete clothing removal and redressing in clean overalls or wrap the individual in a blanket). First aid should be administered while awaiting an ambulance or trained medical personnel. Injuries and illnesses will be reported immediately as described in Section 9.2. A vehicle used to transport contaminated or potentially contaminated personnel will be decontaminated as necessary.

Should an accident occur where an employee rendering first aid is exposed to blood, contact the Project Health and Safety Manager immediately and complete the "Report of Exposure Incident" form (Figure 9-3) as required under the OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030).

9.9 FIRE OR EXPLOSION

In the event of a fire or explosion, the South Plainfield Fire Department should be notified immediately by calling (9-1-1). In addition the Project Health and Safety Manager and Cornrell-Dubilier Electronics Site Contact, and the Project Coordinator should be notified immediately.

9.10 SPILLS AND LEAKS

Personnel will report spills or leaks to the Site Safety Officer and the Project Coordinator. Should a spill or leak occur which is a threat to human health or a release to environment (air, water or soil), the person observing the spill will:

- Evacuate or request an evacuation of any persons at risk.
- Inform Site Safety Officer immediately.
- Locate the source of the spillage and stop the flow if it can be done safely.
- If safe to do so, begin containment and recovery of the spilled materials utilizing appropriate response methodology and PPE.

9.11 EMERGENCY EQUIPMENT AND FACILITIES

The following equipment will be available on this work site:

- First aid kit
- Fire extinguisher
- Portable eye wash
- Emergency water supply (10 gallon minimum) for emergency drenching

9.12 COMMUNITY RESPONSE PLAN

During field activities, air monitoring will be necessary to protect the surrounding community. These activities will be conducted in accordance with the procedures specified for Community Air Monitoring in Section 7.2 for volatile organic compounds and particulates.

TABLE 9-1

EMERGENCY CONTACT PHONE LIST
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE, SOUTH PLAINFIELD, NJ

<u>KEEP AVAILABLE AT ALL TIMES</u>

Cornell-Dubilier Electronics Superfund Site,
333 Hamilton Blvd.
South Plainfield, NJ, 07080

RI Task Manager – Timothy Roeper	(201) 529-5151 ext. 7173

EMERGENCY SERVICES

Muhlenberg Hospital	(908) 668-2000
South Plainfield Police Department	(908) 226-7681
South Plainfield Fire Department	**911** or (908) 756-4701
Middlesex County Sheriff Department	**911** or (732) 745-3381
Emergency Disaster Control	(732) 356-0087
Poison Control Center	(800) 962-1253
Regional USEPA Emergency Response	(800) 425-8500
National Response Center	(800) 424-8802

HydroQual, Inc. Personnel
Mahwah, New Jersey

Office Number: (201) 529-5151
Office Fax: (201) 529-5728

Project Manager	Gary DiPippo	Work Ext.: 7175	Home: (973) 875-3606
RI Task Manager	Timothy Roeper	Work Ext.: 7173	Home: (845) 361-2951
Site Safety Officer	TBD	Work Ext.:	Home:
Alt. Site Safety Officer	TBD	Work Ext.:	Home:
Project H&S Manager	Timothy Roeper	Work: 201-529-5151	Mobile: 845-216-9630

TABLE 9-2

EMERGENCY RECOGNITION AND CONTROL MEASURES

Hazard	Specific Condition Location	Prevention Control
Fire/Explosion	Borehole; wellhead; gasoline fueled equipment; electrical equipment	Fire/safety inspections; Alarm system; Fire extinguisher; Evacuation routes
Air Release – dust or vapors	Drilling; borehole, wellhead; seal opening with on-site material; vapor intrusion testing	Water spray; Alarm system; Evacuation routes
Spill	Drill cuttings; groundwater; Decon solvents and contaminated water/residues	Berms and dikes; Sorbent materials; Alarm system; Evacuation routes

TABLE 9-3

EVACUATION ROUTES AND SAFE DISTANCES

EVACUATION ROUTES

- Place in predominantly upwind direction from the Exclusion Zone
- Run the route through the Contamination Reduction Zone
- Develop main and alternate routes to exit the site
- Consider the mobility constraints of personnel wearing personal protective equipment

SAFE DISTANCES

- Dependent on specific conditions present at the time of an incident
- Depends on toxicological and physical properties of the released substance
- Depends on quantity, rate, and method of release
- Depends on wind speed and direction
- Depends on air temperature
- Depends on local topography

The 2000 North American Emergency Response Guidebook can provide helpful information on determining safe distances when working with chemical releases.

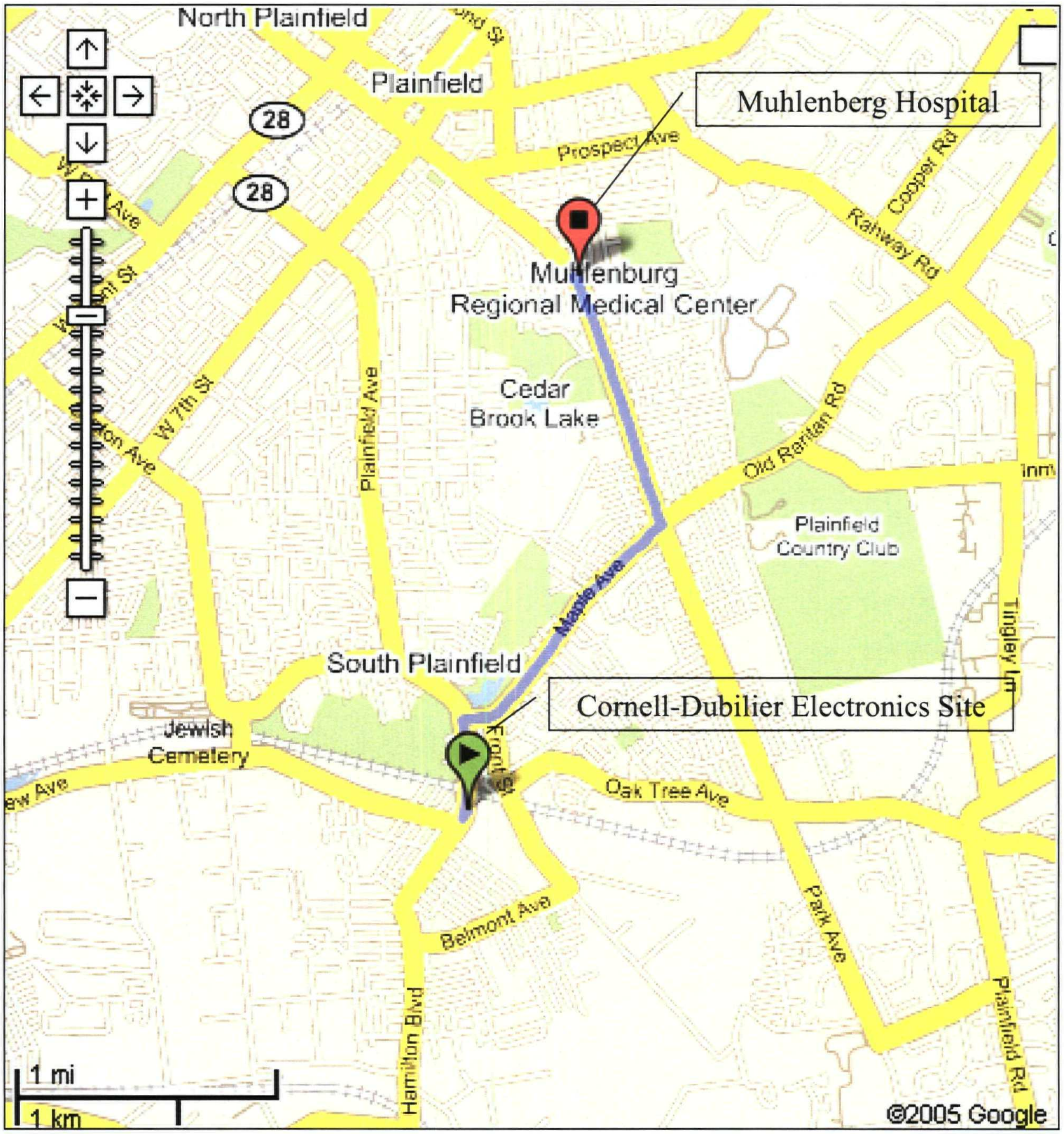


FIGURE 9-1

Route to the Hospital

Cornell-Dubilier ElectronicsSuperfund Site
South Plainfield, New Jersey

HydroQual Environmental Engineers and Scientists, P.C.

FIGURE 9-2

CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
OPERABLE UNIT 3
ACCIDENT / INCIDENT REPORT

Individual Reporting: ______________________________ Date: __________
Time: __________

Location of Accident/Incident: ______________________________

Nature of Accident/Incident and Cause: ______________________________

Chemical Compounds Involved: ______________________________

Electrical Apparatus Involved: ______________________________

Individuals Involved: ______________________________

Supervised by: ______________________________

Type of Emergency Actions Required: ______________________________

Performed by: ______________________________

Equipment Used: ______________________________

Emergency Organizations Notified: ______________________________

First Aid Provided To: ______________________________

Nature and Extent of Injury: ______________________________

Number of Work Hours Missed by Individual(s): ______________________________

Duration Work Area Closed: ______________________________

Actions Required to Prevent Reoccurrence of Accident/Incidents: ______________________________

Actions Initiated to Prevent Reoccurrence: ______________________________

This report must be submitted within ten working days to the Corporate Health and Safety Officer.

FIGURE 9-3

BLOODBORNE PATHOGEN
REPORT OF EXPOSURE INCIDENT

______________________________ / ______________________________
Exposed Employee Name / Job Title

______________________________ / ______________________________
Date of Incident / Social Security Number

Describe the route(s) of exposure and body part(s) affected:

Describe the circumstances surrounding the incident:

State the name(s) of the individual(s) whose blood or other potentially infectious materials you were exposed to: (If unknown, can you describe them?)

What could be done in the future to prevent this type of exposure?

Please initial the appropriate consent below:

I consent to having my blood drawn and tested as soon as possible for the AIDS virus, Hepatitis B, and any other test my healthcare professional deems appropriate.

____

I consent to having my blood drawn but will decide about testing within the next 90 days.

____

I do not consent to having my blood drawn. __________

______________________________ / ______________________________
Employee's Signature / Today's Date

Please take this form to your healthcare professional and have a blood sample drawn as soon as possible. You have 90 days to decide if you want it tested for AIDS, Hepatitis B, etc. All tests and evaluations are strictly confidential. Your healthcare professional will inform you of any medical evaluation, counseling, and/or follow-up appropriate for you.

APPENDIX A

PROCEDURES FOR THE FIELD OPERATIONS OF HNU/OVA

CONTENTS

PROCEDURES FOR THE FIELD OPERATION OF HNU PI 101 PHOTOIONIZER

CALIBRATION

A complete maintenance schedule is performed on the HNU analyzer by an Instrumentation Specialist (IS). This schedule includes in-house calibration and operation prior to field use, plus cleaning, calibration, and operational checks upon return. However, field calibration is mandatory on the species and concentration range required by the individual operator. The following steps should be performed to properly calibrate the HNU analyzer, utilizing isobutylene for calibration with the 10.2 or 11.7 eV probe. Ambient concentrations of volatile organic compounds are reported as ppm benzene. The process of calibration will be performed outside of any suspect or contaminated area. Calibration of the HNU analyzer will be conducted at the beginning of each day, when the range is changed, or if problems with the instrument are encountered.

Step 1 • Set the range setting at X10 (this range will provide accurate values on the X1 range also).

Step 2 • Attach the 10.2 or 11.7 probe to the read-out assembly, insuring red interlocking switch is depressed.

Step 3 • Attach the isobutylene gas cylinder regulator to the HNU 10.2 or 11.7 probe.

Step 4 • Adjust the flow from the regulator so that only a little excess flow is registered at the flowmeter. (Insures HNU sees calibration gas at atmospheric pressure and ambient temperature). NOTE: If calibration gas cylinder reads 300 psi or less, the cylinder should not be used as it may cause concentration variations.

Step 5 • Turn function switch to BATT and ensure the needle is in green area. (If not, battery requires recharging.)

Step 6 • Turn function switch to STANDBY. Set zero point with zero set control.

Step 7 • For 0 to 20 or 0 to 200 range, turn function switch to that setting and note meter reading. Adjust SPAN control to read the ppm concentration of the calibration gas which is noted on each cylinder of calibration gas.

Recheck zero setting (Step 6). If readjustment is required, repeat Step 7. (This gives a two-point calibration, zero and the calibration gas standard point).

Step 8 • Calibration checking:

-- Immediately after calibration, make a reading using the isobutylene standard. The concentration as stipulated on the isobutylene cylinder should be reflected.

-- Periodic checks using the isobutylene standard during the period of HNU operation can provide a rapid calibration check in the field. The field results should compare with that concentration found during initial calibration check.

Any problems encountered with calibration should warrant contact with the Project Health and Safety Manager or Instrumentation Specialist. Under no circumstances will the HNU be utilized in the field until all problems have been resolved, and proper calibration accomplished.

PROCEDURES FOR THE FIELD OPERATIONS OF AN OVA (ORGANIC VAPOR ANALYZER)

A maintenance schedule is performed on the Organic Vapor Analyzer (OVA) by HYDROQUAL, INC.'s Instrumentation Specialist. This schedule includes in-house calibration and operation, primary filter cleaning, secondary filter cleaning, burner assembly filter cleaning, exhaust flame aerator cleaning, and sampling fixture cleaning. Further maintenance performed, as specified by the manufacturer, includes the hydrogen tank supply and refill valves, and air sampling system maintenance.

Field calibration of the OVA 128 is mandatory on the species and concentration range required by the individual operator. While at the time of manufacture the unit is calibrated to mixtures of methane in air, for precise analysis it is necessary to recalibrate with the specific compound of interest. To operate in the survey mode for the detection of total organic vapors, a known sample of methane in air in the range of 90 to 100 ppm is used.

The following steps should be performed to properly calibrate the OVA 128, utilizing methane or a gas specific for the species of interest. The process of calibration is performed outside of any suspect or contaminated area and should be performed once each morning and afternoon before active use. Additional calibration should be conducted whenever the range is changed or if problems with the instrument are encountered.

Step 1 Obtain a sample of methane in air in the range of 90 to 100 ppm.

Step 2 Start instrument and allow to operate for 15 minutes; set Calibrate Switch to X10.

Step 3 Zero background by use of the Calibrate Adjust (zero) knob.

Step 4 Draw a sample of the calibration gas into the instrument.

Step 5 The gas select knob on the panel is then used to set the readout meter indication to correspond to the concentration of the calibration gas mixtures. Record the Gas Select knob setting for future reference.

Note: Other air and sample gas mixtures may be used and calibrated in the same manner as that for air and methane. Recording the Gas Select knob setting for each will provide a library of references should that particular gas require investigation. To investigate a gas following calibration, turn the Gas Select knob from that of methane to that previously recorded for the species of interest determined during calibration.

Should the OVA encounter extremely high (>1,000 ppm) concentrations of a gas, or should the detector be contaminated by an oily compound, a more extensive calibration process may be required. Prior to beginning this mode of calibration, check the calibration by the previous five steps. Should the Gas Select knob not require adjustment from the previous setting recorded, the following calibration procedure will not be required.

To calibrate the OVA after a major malfunction, following an encounter with high concentration, and/or after the detector is cleaned, the succeeding steps must be followed:

Step 1 Place instrument into normal operation with the Calibrate Switch set to X10 and the Gas Select control set to 300.

Step 2 Adjust the meter to zero by use of the Calibrate Adjust (zero) knob.

Step 3 Introduce a methane sample of a known concentration (between 90 and 100 ppm, <u>not to exceed 100 ppm)</u> and adjust the R-32 trimpot (found behind the main unit frame following removal from the blue case) so that the meter reading corresponds to the known calibration sample. The instrument gain for methane has now been set at a reference number of 300.

Step 4 Turn off the Hydrogen Supply Value to put out flame.

Step 5 Leave the Calibrate Switch on X10 position and use the Calibrate Adjust (zero) knob to adjust the meter reading to 4 ppm.

Step 6 Place the Calibrate Switch into the X1 position and using the trimpot R-31 (found next to R-32), adjust the meter reading to 4 ppm.

Step 7 Move the Calibrate Switch to the X10 position and using the Calibrate Adjust (zero) knob, adjust the meter to read 40 ppm.

Step 8 Move the Calibrate Switch to the X100 position, and using the trimpot R-33 (found next to R-32), adjust the meter reading to 40 ppm.

Step 9 Move the Calibrate Adjust (zero) knob to adjust the meter reading to zero.

The unit is now balanced from range to range, calibrated to methane, and ready to be placed into normal service.

Any problems encountered during either calibration process will warrant contact with the Project Health and Safety Manager or the Instrumentation Specialist. Under no circumstances will the OVA 128 be utilized in the field until all problems have been resolved, and proper calibration accomplished.

APPENDIX B

DECONTAMINATION PROCEDURES

CONTENTS

B. DECONTAMINATION PROCEDURES

B.1 INTRODUCTION

Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel and equipment. Adequate decontamination is critical to health and safety at hazardous work sites. Decontamination protects:

- Workers against exposure substances that may contaminant and eventually permeate protective clothing
- Respiratory equipment
- Tools
- Vehicles
- Various equipment used on site
- Site personnel by minimizing transfer of contaminants into clean areas
- Against mixing of incompatible chemicals
- Against transport of contaminants from the site

B.2 DECONTAMINATION PLAN

A decontamination plan is developed as a part of the Site Control Measures (Section 8) and established prior to any personnel or equipment entering the area where potential for exposure exists. For this site the decontamination plan should:

- Determine the number and layout of decontamination stations . Determine the decontamination equipment required. Determine the appropriate decontamination methods. Establish procedures to prevent contamination of clean areas.
- Establish methods and procedures to minimize worker contact with contaminants during removal of personal protective clothing and equipment (PPE).
- Establish methods for disposing of clothing and equipment not completely decontaminated.

The plan should be reviewed/revised whenever the type of personal protective clothing or equipment changes, the site conditions change, or the site hazards are reassessed.

B.3 PREVENTION OF CONTAMINATION

The first step in decontamination is to establish operating procedures to minimize contact with the hazardous materials. Methods to accomplish this include:

- Work practices that minimize contact with the hazardous substances
- Use of remote sampling, handling
- Protection of monitoring and sampling instruments by bagging
- Use of disposable outer garments and disposable equipment where appropriate
- Use of covers for equipment and tools with a strippable coating that can be removed during decontamination
- Encasement of the source of contaminants with plastic sheeting or overpacks

In addition, operating procedures should be established that maximize worker protection. Proper procedures for dressing prior to entering the area of contamination will minimize the potential for contaminants to by-pass the protective clothing and escape decontamination.

B.4 TYPES OF CONTAMINANTS

Contaminants can be located either on the surface of personal protective equipment (PPE) or permeate into the PPE equipment. Surface contaminants may be easy to detect and remove, but contaminants that have permeated the material are difficult to detect and remove. If contaminants that have permeated a material are not removed by decontamination, they may continue to permeate the material where upon they could cause an unexpected exposure.

Five major factors affect the extent of permeation:

- <u>Contact time</u>. The longer a contaminant remains in contact with the object, the greater the probability for and extent of permeation.
- <u>Concentration</u>. As concentrations of hazardous substances increase, the potential for permeation of PPE increases. Temperature. An increase in temperature generally increases the permeation rate of contaminants.
- <u>Size of contaminant molecules</u> and <u>pore space</u>. Permeation increases for smaller sized contaminant molecules.

- Physical state of wastes. As a rule, gases, vapors, and low viscosity liquids tend to permeate more readily than high viscosity liquids or solids.

B.5 DECONTAMINATION METHODS

Personnel, clothing, equipment, and samples leaving the contaminated area of a site must be decontaminated to remove any harmful chemicals or infectious organisms that may have adhered to them. Decontamination methods either:

- Physically remove contaminants
- Inactivate contaminants by chemical detoxification or disinfection and sterilization
- Remove contaminants by a combination of physical and chemical actions.

Various decontamination methods are shown in Table B-1 at the end of this section.

In many cases gross contamination can be removed by dislodging or displacement, rinsing, wiping, and evaporation. Contaminants that can be removed by physical means include:

- Loose contaminants. Dusts and vapors that cling to equipment and workers or become trapped in small openings can be removed by water or a liquid rinse. Removal of electrostatically attached materials can be enhanced by coating the clothing or equipment with anti-static solutions (commercially available as wash additives or anti-static sprays).

- Adhering contaminants. Some contaminants may adhere by forces other than electrostatic attraction. Adhesive qualities will vary according to the specific contaminant and the temperature. Contaminants such as glue, cements, resins, and muds have greater adhesive properties and are difficult to remove by physical means. Physical removal for gross contaminants include scraping, brushing, and wiping. Removal of adhesives can be enhanced through solidifying, freezing (i.e., using dry ice or ice water), adsorption or absorption (i.e., with powdered lime or kitty litter), or melting.

- Volatile liquids. Volatile liquid contaminants can be removed from protective clothing and equipment by evaporation followed by a water rinse. The evaporation may be enhanced through the use of steam jets. However, special care must be taken to prevent worker inhalation during an evaporation or vaporization process.

Physical removal of a contaminant should be followed by a wash and rinse process utilizing a cleaning solution(s). Cleaning solutions normally utilize one or more of the following mechanisms found in Table B-1 at the end of this section.

- Dissolving contaminants. A solvent may be utilized to remove surface contaminants, though the solvent must be compatible with the equipment being cleaned. This is particularly important when decontaminating personal protective clothing constructed of organic materials that may be damaged or destroyed by organic solvents. Additional care must be taken with solvents that may be flammable or potentially toxic. Organic solvents include alcohols, ethers, ketones, aromatics, straight-chain alkanes, and common petroleum products.

  Halogenated solvents generally are incompatible with PPE and are toxic. Their use should be restricted only to extreme cases where other cleaning agents are ineffective.

  Table B-2 provides a general guide to the solubility of several contaminant categories in four types of solvents: water, dilute acids, dilute bases, and organic solvents. Because of the potential hazards, decontamination using chemicals should be done only if recommended by an industrial hygienist or qualified health professional. Material Safety Data Sheets (MSDS) for any chemicals used for decontamination purposes must be reviewed by field personnel and a copy must be maintained on site.

- Surfactants. Surfactants augment the physical cleaning methods by reducing adhesion forces between contaminants and the surface being cleaned and reducing redeposition. Household detergents are among the most common surfactants. Some detergents can be used with organic solvents to improve the dispersal and dissolving of the contaminant into the solvent.

- Solidification. Solidifying liquid or gel contaminants can enhance their physical removal. The mechanisms of solidification include: moisture removal by the use of absorbents (i.e., ground clay or powdered lime); chemical reactions through polymerization catalysts and chemical reagents; freezing by use of ice water.

- Rinsing. Rinsing removes contaminants through dilution, physical attraction, and solubilization. Multiple rinses with clean solutions remove more contaminants than a single rinse with the same volume of solution.

- Disinfection and sterilization. Chemical disinfectants are a practical means of inactivating infectious agents. However, standard sterilization techniques are impractical for large equipment and for PPE equipment. Therefore, disposable PPE is recommended for use with infectious agents.

Numerous factors such as cost, availability, and ease of implementation influence the selection of a decontamination method. From a health and safety standpoint, two key questions must be addressed:

- Is the decontamination method effective for the specific substances present?
- Does the method itself pose any health or safety hazards?

B.6 TESTING THE EFFECTIVENESS OF DECONTAMINATION

Decontamination methods vary in their effectiveness for removing different substances. The effectiveness of any decontamination method should be assessed at the beginning and periodically through the lifetime of the program. The following methods can be useful in assessing the effectiveness of decontamination.

- Visual observation. In some cases, effectiveness can be estimated by visual observation in natural light (i.e., discolorations, stains, corrosive effects, visible dirt or alterations in clothing fabric) or by ultraviolet light (UV) (i.e., polycyclic aromatic hydrocarbons may be common in many refined oils and solvent wastes, fluoresce when exposed to UV light) which can be used to detect contamination on the skin, clothing, and equipment. Care when utilizing UV light on the skin must be taken as certain areas of the skin may naturally fluoresce and UV light can increase the risk of skin cancer and eye damage. A qualified health professional should be consulted prior to the use of UV light at a site.

- Wipe sampling. Wipe testing provides after-the-fact information concerning the effectiveness of decontamination. The procedure can be accomplished by using a dry or wet cloth, glass fiber filter paper, or a swab which is wiped over the potentially contaminated object and analyzed in a laboratory. Both the inner and outer surfaces of the clothing, equipment, and skin may be tested in this manner.

- Cleaning solution analysis. Another means by which the effectiveness of decontamination can be tested is by analyzing the contaminants in the cleaning solutions. Elevated concentrations in the final rinse may indicate additional cleaning and rising are required.

- Permeation testing. To test for the permeation of chemical contaminants requires that swatches of the clothing material be submitted for analysis.

B.7 DECONTAMINATION FACILITY DESIGN

The decontamination facility design is dependent on the level and types of decontamination procedures required and on site specific factors. The decontamination process must provide for a series of procedures performed in a specific sequence. An example of an orderly procedure for decontamination may include:

- Equipment drop area
- Outer, more heavily contaminated items such as outer boots and gloves decontaminated and removed first
- Decontamination and removal of inner less contaminated items such as shirts and pants
- Removal of respiratory protective device followed by last inner gloves

Each step should be performed at separate and segregated stations to prevent contamination cross over. In addition, each step should be arranged in order of decreasing contamination. Minimum and maximum decontamination layouts are shown in Figures B-1, B-2 and B-3 at the end of this section.

B.8 DECONTAMINATION EQUIPMENT SELECTION

Table B-3 indicates equipment that can be used for decontamination of personnel, personal protective equipment, and equipment. Table B-4 indicates equipment that can be used for large equipment and vehicles. Table B-5 shows the comparative chemical resistance of various gloves. Other types of equipment listed in these tables may also be appropriate in certain situations.

In selecting decontamination equipment, consider whether the equipment itself can be decontaminated for reuse or can be easily disposed of properly. Buckets, brushes, clothing, tools, and other contained equipment should be collected, placed into containers, and labeled. In addition, all spent solutions and wash water should be collected and disposed of properly.

B.9 PERSONAL PROTECTION

Personal protection of workers in the DECON area must be addressed. In some cases the PPE required may be identical to that worn by those individuals exiting the work zone. However, in most cases the level of protection required in the DECON area is one step lower. The level of protection will vary with the type of DECON equipment used. Utilization of a steam jet may require different respiratory protection due to the moisture levels produced or the cleaning solutions used, and wastes removed during decontamination may generate harmful vapors.

Decontamination workers are in a contaminated area and must themselves be decontaminated before entering the clean support zone. The extent of their decontamination should be determined by the types of contaminants they may have contacted and the type of work they perform.

B.10 EMERGENCY DECONTAMINATION

In addition to routine decontamination procedures, emergency decontamination procedures must be established. In an emergency, the primary concern is to prevent the loss of life or severe injury to site personnel. Should immediate medical attention be required to save a life, decontamination should be delayed until the victim is stabilized. However, if decontamination can be performed without interfering with first aid or life saving techniques, or should a worker be contaminated with an extremely toxic or corrosive material that has the potential to cause severe injury or loss of life, decontamination must be performed immediately. If an emergency due to a heat-related illness develops, protective clothing should be removed from the individual to reduce heat stress. During an emergency, provision must also be made for protecting medical personnel and disposing of contaminated clothing and equipment.

B.11 SITE-SPECIFIC DECONTAMINATION

To prevent cross-contamination (i.e., transport of contaminants from one location to another), downhole drilling equipment and sampling equipment, including submersible pumps, bailers, and tubing will be decontaminated before use and after each exploration. Steam cleaning of drilling equipment will be conducted at each drilling site at the designated decontamination area.

The field sampling equipment and decontamination procedures to be used in this Remedial Investigation are based on EPA Regional requirements and are as follows:

a. wash and scrub with low-phosphate detergent
b. tap water rinse
B. rinse with 10% HNO3 ultrapure (Only when sample analyzed for metals)
d. tap water rinse
e. an acetone-only rinse or a methanol followed by a hexane rinse (solvent must be pesticide-grade or better)
f. thorough rinse with deionized demonstrated analyte-free water
g. air dry
h. wrap in aluminum foil for transport

The volume of water used during step (f) will be at least five times the volume of solvent used in step (e). Tap water may be used from any municipal water treatment system. The use of an untreated water supply is not an acceptable substitute. If metal samples are not being collected, the 10% nitric acid (HNO3) rinse may be omitted, and conversely, if organic samples are not being taken, the solvent rinse may be omitted. When it is necessary to use steel spoons for sampling, the nitric acid rinse should be lowered to a concentration of 1% instead of 10% so as to reduce the possibility of leaching metals from the spoon itself.

Precautions must be taken to limit the amount of contaminated materials which could come in contact with personal or rented vehicles brought on site.

Personal or rented vehicles will be parked in a "clean" zone whenever practical. If vehicles are driven on-site in potentially contaminated areas, the vehicles will be decontaminated (by steam cleaning) at the designated decontamination area prior to leaving the site. When vehicles are driven in potentially contaminated areas, care should be used to avoid puddles of water or other sources of contaminated materials.

Table B-1. Decontamination Methods

REMOVAL

Contaminant Removal

Water rinse, using pressurized or gravity flow.

Chemical leaching and extraction.

Evaporation/vaporization.

Pressurized air jets.

Scrubbing/scraping. Commonly done using brushes, scrapers, or sponges and water-compatible solvent cleaning solutions.

Steam jets.

Removal of Contamination Surfaces

Disposal of deeply permeated materials, e.g., clothing, floor mats, and seats.

Disposal of protective coverings/coatings.

INACTIVATION

Chemical Detoxification

Halogen stripping.

Neutralization.

Oxidation/reduction.

Thermal/degradation.

Disinfection/Sterilization

Chemical disinfection.

Dry heat sterilization.

Gas/vapor sterilization.

Irradiation.

Steam sterilization.

Table B-2. Contaminant Solubility Guide In Four Solvent Types

Solvent	Soluble Contaminants
Water	Low-chain hydrocarbons. Inorganic compounds. Salts. Some organic acids and other polar compounds.
Dilute Acids	Basic (caustic) compounds. Amines. Hydrazines.
Dilute Bases Acidic compounds. For example: -detergent -soap	Phenols. Thiols. Some nitro and sulfonic compounds.
Organic Solvents For example: -alcohols -ethers -ketones -aromatics -straight-chain alkanes (e.g., hexane) -common petroleum products (e.g., fuel oil, kerosene)	Nonpolar compounds (e.g., some organic compounds).

[a]WARNING: Some organic solvents can permeate and/or degrade the protective clothing.

Table B-3. Personnel Decontamination Equipment

Drop cloths of plastic or other suitable materials on which heavily contaminated equipment and outer protective clothing may be deposited.

Collection containers, such as drums or suitably lined trash cans, for storing disposable clothing and heavily contaminated personal protective clothing or equipment that must be discarded.

Lined box with absorbents for wiping or rinsing off gross contaminants and liquid contaminants.

Large galvanized tubs, stock tanks, or children's wading pools to hold wash and rinse solutions. These should be at least large enough for a worker to place a booted foot in, and should have either no drain or a drain connected to a collection tank or appropriate treatment system.

Wash solutions selected to wash off and reduce the hazards associated with the contaminants.

Rinse solutions selected to remove contaminants and contaminated wash solutions.

Long-handled, soft-bristled brushes to help wash and rinse off contaminants.

Paper or cloth towels for drying protective clothing and equipment.

Lockers and cabinets for storage of decontaminated clothing and equipment.

Metal or plastic cans or drums for contaminated wash and rinse solutions.

Plastic sheeting, sealed pads with drains, or other appropriate methods for containing and collecting contaminated wash and rinse solutions spilled during decontamination.

Shower facilities for full body wash or, at a minimum, personal wash sinks (with drains connected to a collection tank or appropriate treatment system).

Soap or wash solution, wash cloths, and towels for personnel.

Lockers or closets for clean clothing and personal item storage.

Table B-4. Vehicle Decontamination Equipment

Storage tanks of appropriate treatment systems for temporary storage and/or treatment of contaminated wash and rinse solutions.

Drains or pumps for collection of contaminated wash and rinse solutions.

Long-handled brushes for general exterior cleaning.

Wash solutions selected to remove and reduce the hazardous associated with the contamination.

Rinse solutions selected to remove contaminants and contaminated wash solutions.

Pressurized sprayers for washing and rinsing, particularly hard-to-reach areas.

Curtains, enclosures, or spray booths to contain splashes from pressurized sprays.

Long-handled brushes, rods, and shovels for dislodging contaminants and contaminated soil caught in tires and the undersides of vehicles and equipment.

Containers to hold contaminants and contaminated soil removed from tires and the undersides of vehicles and equipment.

Wash and rinse buckets for use in the decontamination of operator areas inside vehicles and equipment.

Brooms and brushes for cleaning operator areas inside vehicles and equipment.

Containers for storage and disposal of contaminated wash and rinse solutions, damaged or heavily contaminated parts, and equipment to be discarded.

Table B-5. Glove Materials - Comparative Chemical Resistance

(KEY: E - excellent; G - good; F - fair; P - poor; NR - not recommended)

Chemical	Neoprene	Natural Latex or Rubber	Milled Nitrile	Butyl
Acetaldehyde	E	G	G	E
Acetate	G	F	P	G
Acetic acid	E	E	E	E
Acetone	G	E	P	E
Acetylene gas	E	E	E	E
Acetylene tetrachloride	F	NR	F	F
Acrylonitrile	G	F	F	G
Amidol	G	E	F	E
Amine hardeners	F	F	G	G
Ammonium hydroxide	E	E	E	E
Amyl acetate	F	P	P	F
Amyl alcohol	E	E	E	E
Anhydrous ammonia	G	E	E	E
Aniline	G	F	P	F
Aniline hydrochloride	F	G	P	F
Aniline oil	F	G	P	F
Animal fats	E	P	E	G
Animal oils	E	F	E	G
Anodex	G	E	--	E
Anthracene	F	P	F	P
Aromatic fuels	P	NR	F	NR
Arsine	E	E	E	E
Asbestos	E	E	E	E
Asphalt	G	F	E	F
Banana oil	F	P	P	F
Benzaldehyde	F	F	G	G
Benzene	P	NR	F	NR
Benzol	P	NR	F	NR
Benzyl alcohol	E	E	E	E
Benzyl benzoate	G	F	G	F
Benzyl chloride	F	P	F	G
Biacosolve	G	P	G	P
Boron tribromide	G	P	P	P
Bromine	G	P	P	P
Bromoform	G	P	P	P
Butane	E	F	E	F
2-Butanone	G	G	F	G
Butyl acetate	G	F	P	F
Butyl alcohol	E	E	E	E
Butylaldehyde	G	G	E	G
Butylene	E	G	E	G
Cadmium oxide fume	E	E	E	E
Calcium hydroxide	E	E	E	E
Carbolic acid	E	E	F	E
Carbon dioxide	E	E	E	E
Carbon disulfide	F	F	F	F
Carbon tetrachloride	F	P	G	P
Castor oil	F	P	E	F
Cellosolve	F	G	G	G
Cellosolve acetate	G	F	G	G
Chlordane	G	F	G	F
Chlorine	G	F	F	G
Chlorine gas	G	F	F	G
Chlorobenzene	F	P	P	F
Chloroacetone	F	F	P	E
Chlorobromomethane	F	P	F	P
Chloroform	G	P	E	P
Chloronaphthalene	F	P	F	F
Chlorophenylene diamine	G	P	F	F
Chloropicrin	P	P	P	F
Chloroethene	P	NR	F	NR
Chromic acid	F	P	F	F
Chromotex	G	G	G	G
Citric acid	E	E	E	E
Cool tar pitch volatiles	F	P	F	--
Cottonseed oil	G	G	E	F
Cotton dust (raw)	E	E	E	E
Creosote	G	G	F	G
Cresol	G	G	F	G
Cupric nitrate	G	G	E	E

Chemical	Neoprene	Natural Latex or Rubber	Milled Nitrile	Butyl
Cyanide	G	G	G	G
Cyclohexane	G	F	G	F
Cyclohexanol	G	F	E	G
Cyclohexanone	G	E	F	G
Decaborane	F	P	F	F
Degreasing fluids	F	P	G	P
Diacetone alcohol	E	E	E	E
Diborane	F	P	F	F
Dibenzyl ether	G	G	F	G
Dibutyle phthalate	G	P	G	G
Dichloroethane	P	NR	F	NR
Dichloropropene	P	P	F	F
Diesel fuel	G	P	E	P
Diethanolamine	E	G	E	E
Diethylamine	E	G	E	G
Diethyltriamine	G	F	E	G
Diisobutyl ketone	P	F	P	G
Diisocyanate	G	P	G	E
Dimethyl formamide	F	F	G	G
Dioctyl phthalate	G	P	E	F
Dioxane	E	G	G	G
Emulsifying agent	G	F	E	E
Emulthogene	G	F	G	E
Epichlorohydrin	G	P	F	G
Epoxy resins, dry	E	E	E	E
Esters	F	P	P	F
Ethane gas	E	G	E	E
Ethanol	E	E	E	E
Ethers	E	G	G	G
Ethyl acetate	G	F	F	G
Ethyl alcohol	E	E	E	E
Ethyl bromide	--	--	P	--
Ethyl ether	E	G	G	E
Ethyl cutyl ketone	--	--	P	--
Ethyl formate	G	F	G	G
Ethylaniline	F	F	P	G
Ethylenediamine	E	G	E	G
Ethylene dichloride	F	P	P	F
Ethylene gas	E	G	E	E
Ethylene glycol	E	E	E	E
Ethylene oxide	G	F	G	--
Ethylene trichloride	F	P	G	P
Fatty acids	E	P	E	F
Ferrocyanide	F	G	G	E
Fluoric acid	E	G	E	E
Fluorine	G	F	F	G
Flourine gas	G	F	F	G
Formaldehyde	E	E	E	E
Formic acid	E	E	E	E
Freon 11	G	P	G	F
Freon 12	G	P	G	F
Freon 21	G	P	G	F
Freon 22	G	P	G	F
Furfural	G	G	G	G
Gasoline, leaded	G	P	E	F
Gasoline, unleaded	G	P	E	F
Glycerine	E	E	E	E
Glycerol	E	E	E	E
Glycol	E	E	E	E
Gold fluoride	G	E	E	E
Grain alcohol	E	E	E	E
Halogens	G	F	F	G
Hexamethylenetetramine	F	G	F	G
Hexane	F	P	G	P
Hexyl acetate	F	P	P	F
Hydraulic oil	--	--	--	--
ester base	E	P	F	G
petroleum base	G	P	E	P
Hydrazine	F	G	G	G
Hydrochloric acid	E	G	G	G
Hydrofluoric acid	E	G	G	G

Table B-5 (Continued)

Glove Materials - Comparative Chemical Resistance

(KEY: E - excellent; G - good; F - fair; P - poor; NR - not recommended)

Chemical	Neo-prene	Natural Latex or Rubber	Milled Nitrile	Butyl
Hydrogen gas	E	E	E	E
Hydrogen peroxide 30%	G	G	G	G
Hydrofluosilicic acid	F	G	G	G
Hydroquinone	G	G	F	G
Inorganic salts	E	E	E	E
Iodine	G	F	G	G
Isooctane	F	P	E	P
Isopropanol	E	E	E	E
Isopropyl alcohol	E	E	E	E
Kerosene	E	F	E	F
Ketones	G	E	P	E
Lacquer thinner	G	F	P	F
Lactic acid	E	E	E	E
Lauric acid	E	F	E	E
Lineoleic acid	E	P	E	F
Linseed oil	E	P	E	F
Maleic acid	E	E	E	E
Mercuric chloride	G	E	G	E
Mercury	G	G	G	E
Methane gas	E	E	E	E
Methanol	E	E	E	E
Methyl acetate	G	F	P	G
Methyl alcohol	E	E	E	E
Methylamine	F	F	G	G
Methyl bromide	G	F	F	G
Methyl cellosolve	G	G	G	G
Methyl chloride	NR	NR	NR	NR
Methyl ethyl ketone	G	G	NR	E
Methyl formate	G	F	F	G
Methylene bromide	G	G	F	G
Methylene chloride	G	F	F	G
Methyl isobutyl ketone	F	F	P	E
Methyl methacrylate	G	G	F	E
Mineral oils	E	F	E	F
Monochlorobenzene	F	P	P	F
Monoethanolamine	E	G	E	E
Morpholine	E	E	G	E
Muriatic acid	E	G	G	E
Naphthalene	G	F	G	F
Naphthas, aliphatic	E	F	E	F
Naphthas, aromatic	G	P	G	P
Nitric acid	G	F	F	F
Nitric acid, red and	--	--	--	--
white fuming	P	P	P	P
Nitrobenzene	F	P	F	F
Nitroethane	F	P	F	F
Nitrogen gas	E	E	E	E
Nitromethane	F	P	F	F
Nitropropane	F	P	F	F
Nitrous oxide	G	G	G	G
Octyl alcohol	E	E	E	E
Oleic acid	E	F	E	G
Oxalic acid	E	E	E	E
Oxygen, liquid	F	P	NR	F
Ozone	G	P	P	G
Paint thinners	G	F	G	F
Paint / varnish removers	G	F	F	F
Palmitic acid	E	E	E	E
Paradichlorobenzene	E	F	E	E
Parathion	P	F	F	F
Pentaborane	F	P	F	F
Pentachlorophenol	F	G	G	G
Pentane	E	G	E	G
Perchloric acid	E	F	G	G
Perchloroethylene	F	NR	G	NR
Perklene	E	NR	G	NR
Permachlor	E	F	E	NR
Petroleum distillates	G	P	E	-
(naphtha)	--	--	--	--
Petroleum spirits	E	F	E	F
Phenol	E	F	F	G
Phenylenediamine	G	P	G	G
Phenythydrazine	G	G	G	G
Phil. solv	E	F	E	G
Phosphoric acid	E	G	E	E
Pickling solution	G	G	G	E
Picric acid	E	G	E	G
Pine oil	E	P	E	F
Pitch	E	P	E	F
Plating solutions	E	E	E	E
Potassium alum	G	G	G	E
Potassium bromide	G	G	G	E
Potassium chrome alum	G	G	G	E
Potassium dichromate	F	F	F	E
Potassium terrocyanide	G	G	G	E
Potassium hydroxide	E	E	E	E
Printing inks	E	G	G	G
Propane gas	E	E	E	E
Propanol (iso)	E	E	E	E
Propyl acetate	G	F	F	G
Propyl alcohol	E	E	E	E
Propyl alcohol (iso)	E	E	E	E
Propylene gas	E	F	E	E
Propyne gas	E	F	E	E
Pyrethrum	E	E	E	E
Red fuming nitric acid	P	P	P	P
Rhodium fume and dust	E	E	E	E
Silver nitrate	E	G	E	E
Skydrol 500	P	G	P	G
Sodium carbonate metal	G	G	G	E
Sodium hydroxide	E	E	E	E
Sodium sulfite	G	G	E	E
Sodium thiosulfide	G	G	E	E
Solvarsol	E	F	E	F
Solvessos	P	P	G	P
Stearic acid	E	E	E	E
Stoddard solvent	E	F	E	G
Styrene	P	P	F	P
Styrene 100%	P	P	F	P
Sulfuric acid	G	G	G	G
Tannic acid	E	E	E	E
Tetrahydroborane	F	P	F	F
Tetraethyl lead	E	F	E	G
Tetrahydrofuran	P	F	F	F
Toluene	F	P	F	NR
Toluene diisocyanate	F	G	F	G
Toluol	F	P	F	NR
Trichlor	F	P	G	P
Trichloroethane	F	F	G	P
Trichloroethylene	P	P	F	P
Tricresyl phosphate	G	F	E	F
Tridecyl alcohol	G	F	E	F
Triethanolamine	E	G	E	G
Trinitrotoluene	G	P	G	F
Trinitralolual	G	P	G	F
Tripiane	E	P	E	F
Tung oil	E	P	E	F
Turca No. 2998	P	P	-	F
Turpentine	G	F	E	F
Unsymmetrical	--	--	--	--
Dimethylhydrazine	F	P	F	P
Varnoline gas	E	F	E	F
Vanadium fume and dust	E	E	E	E
Varsol	G	F	G	F
Vegetable oils	E	G	E	G
Wood alcohol	E	E	E	E
Wood preservatives	G	F	G	G
Woodyouth	F	P	F	G
Xylene	P	P	F	P
Xylol	P	P	F	P
Xylidene	E	F	F	F
Zinc chloride	E	E	E	E

ATTACHMENT C

PRELIMINARY CONCEPTUAL SITE MODEL (REVISED)

HydroQual

Environmental

Engineers & Scientists

RESPONSE TO COMMENTS

In a letter to Mr. William J. Lee of de maximis, inc., dated December 6, 2005, the USEPA provided comments on the Preliminary Conceptual Site Model (CSM) Report, dated September 19, 2005. Each of the Agency's comments is reiterated below in *italics* followed by a response. The Preliminary Conceptual Site Model Report has been revised consistent with the comments and responses below and is attached for reference.

General Comments

Comment:

The preliminary CSM dismisses the bedrock groundwater/Bound Brook interaction too readily. The interaction between the Bound Brook and the upper, highly fractured bedrock needs to be discussed in more detail in the preliminary CSM and cannot be dismissed as a pathway (see second bullet on page 6-1). The investigation of this interaction should be added to Section 7 – Data Needs.

Response:

It was not the intent of the Preliminary CSM to dismiss the bedrock groundwater/surface water interaction. Although preliminary data indicate that the Bound Brook is a losing stream in the vicinity of the Site, the interaction between the Bound Brook and groundwater within the Passaic formation needs to be further evaluated during the investigation and a specific task for this evaluation is included in the RI Work Plan. The text has been revised to further clarify this understanding.

Comment:

The issue of vapor intrusion is not clearly explained in the CSM. Section 3.2 states "discontinuous zones of perched water occur frequently where unconsolidated natural and fill materials of variable composition interfinger." Section 5 states that "...the presence of shallow uncontaminated groundwater overlying the contaminated groundwater also precludes impact to indoor air." The shallow uncontaminated groundwater does not appear to be continuous across the groundwater plume, so the statement in Section 5 is not likely to be accurate. Therefore, the potential for vapor intrusion may be more likely than the text in Section 5 suggests. EPA recommends that the language in Section 5 be rewritten to more clearly state the uncertainties associated with the fate and transport of subsurface contamination.

Response:

The discussion in Section 5 has been revised to address this comment

Comment:

The preliminary CSM dismisses the potential for NAPL too quickly (see page 4-8, 1st paragraph). The potential for NAPL should be discussed in more detail in the preliminary CSM since concentrations of TCE detected on-site in monitoring well MW-11 may be indicative of NAPL. The preliminary CSM also does not raise the question of potential PCB NAPL. The investigation of whether or not NAPL is present at the site should be added to Section 7 – Data Needs.

Response:

EPA correctly indicates that "concentrations of TCE detected on the site in monitoring well MW-11 may be indicative of NAPL." However, it is worthwhile to note that using traditional guidelines for NAPL presence (such as the "1% rule") in fractured sedimentary rock can be complicated by matrix diffusion of dissolved-phase contaminants back out of the rock matrix (which may have originated as NAPL), which can produce similar dissolved phase concentrations in the fracture network. The occurrence of NAPL within the bedrock system will be evaluated during the investigative activities. The text of the Preliminary CSM has been modified to clarify the intent of this discussion of DNAPL.

Comment:

The preliminary CSM does not present the references for the various parameters that were used as input for the groundwater model. References should be provided.

Response:

The preliminary groundwater flow model was preliminarily calibrated using parameters considered generally representative of the Passaic formation and based on experience. Its present usefulness extends only to an indication that the anisotropy of the rock and the actual pumping rates of nearby water supply wells may be critical parameters to understanding groundwater flow in the fractured rock aquifer. Accordingly, we would propose at this juncture not to spend more time analyzing the preliminary model, particularly because there is insufficient field data for refinement and interpretation.

Comment:

The preliminary CSM does not provide detail on the importance of understanding the various bedrock bedding planes at the site, or region. Current understanding of the Passaic Formation indicates the bedding planes play a major role in groundwater flow through the formation (Michalski, 1996).

Response:

We agree that bedding planes play a major role in governing groundwater flow and have revised the text of the CSM to more clearly indicate that the anisotropy is related to bedding planes. The preliminary CSM highlights the importance of understanding the anisotropy of the bedrock aquifer, which is produced by the bedding planes and other fractures within the rock. Likewise, in addition to areal anisotropy, bedding planes also create a significant vertical anisotropy oriented along dip.

Comment:

The preliminary CSM tends to focus on other sources of contamination, rather than on contaminant migration from the site to off-site areas.

Response:

The preliminary CSM was not intended to focus on other potential sources of contamination. The Site is a source of groundwater contamination. However, the preliminary CSM does acknowledge that in an industrial area such as South Plainfield, there may be other documented and undocumented sources of contamination in the Passaic formation aquifer. The preliminary CSM, therefore, recognizes that an objective of the investigation is to differentiate contamination derived from the Site from other anthropogenic contamination within the Passaic formation aquifer in order to provide an adequate basis for evaluating remedial alternatives.

Comment:

All references to "contaminants of concern" should be revised to "contaminants of potential concern", since the information needed to confirm those contaminants that contribute to unacceptable levels of risk/hazard is not yet available.

Response:

The phrase "contaminants of concern" has been revised to "contaminants of potential concern."

SPECIFIC COMMENTS

Comment:

Page 1-1, Section 1 – The description of the different operable units at the site should be updated to include Operable Unit 4, which will address contaminated sediments of the Bound Brook.

Response:

Section 1 has been revised accordingly.

Comment:

Page 4-1, Section 4.1 – In regards to the reference to "....PCB-contaminated materials and other substances directly on the facility soils," PCBs were also found in high concentrations in subsurface soils down to 14 ft bgs, not just directly on the soil surface.

Response:

The reference to "directly on the facility soils" was intended as a reference to the disposal of PCB-contaminated material, not to the occurrence in the subsurface. The occurrence of PCBs in subsurface soils has been clarified near the end of this sentence.

Comment:

Page 41, Section 4.1 vs. Page 4-7, Section 4.3 – The concentrations for TCE and cis-1, 2-DCE listed are slightly different – this may be a result of original and duplicate sample results. The preliminary CSM states that the maximum TCE value on-site is 120,000 ppb in one part of the text and in another states a "highest concentration" of 100,000 ppb at "MW-11 – CDE site." This may cause confusion.

Response:

The disparity derives from the fact there is a duplicate sample for MW-11. The references to highest concentrations for TCE and cis-1,2-DCE have been reconciled by uniformly using the duplicate sample which had slightly higher concentrations.

Comment:

Page 4-7, Section 4.3 – The table says that MTBE was "not reported at CDE" – it was actually not analyzed.

Response:

The table on page 4-7 has been revised accordingly.

Comment:

Page 4-7, Section 4-3 – It is stated that contaminants of concern are primarily VOCs and PCBs. While acknowledged, as noted on page 4-1., pesticides should also be considered COPCs.

Response:

The text on page 4-7 has been revised accordingly.

Comment:

Section 4-4 – It is stated that although possible, free product is not anticipated and has not been observed in work completed to date. However, the Remedial Investigation for Operable Unit 2 states that field indications of product were observed, as follows: oily water seep at TP05; sheen on ground water surface at TP09; oily sheen on split spoon at MW9; sheen on core at MW11; slight sheen on water infiltrating boring at BSB58; and visible sheen on water at DS05.

Response:

Section 4-4 has been revised to acknowledge the above observations and the discussion regarding DNAPL has been clarified.

Comment:

Section 5 – It is stated that well inventory data were not available from the DEP or Middlesex Water Company at the time of preparation of the CSM. County and local offices (e.g. health department, engineering department, public works, etc.) shall also be contacted to identify wells in accordance with N.J.A.C. 7:26E-3.7 (e) 3i(1).

Response:

Section 5 has been modified accordingly.

Comment:

Section 5 – The fate and transport mechanism of vapor intrusion may be of concern to structures that are near, as well as directly above, subsurface contamination. Please revise the language to include these nearby structures in the CSM.

Response:

The text of Section 5 has been revised to reflect this comment.

Comment:

Page 5-1, Section 5 – The "dermal contact from use of impacted groundwater" exposure pathway is not listed as a possibility. This exposure pathway should be incorporated in the preliminary CSM.

Response:

Section 5 has been revised to include "dermal contact" as a potential route of exposure.

Comment:

Page 5-1, second paragraph – Please remove the sentence "...low permeability soils...reduces or eliminates the potential for impacts to indoor air." This may or may not be true depending upon the conditions and location of each structure.

Response:

The paragraph has been revised to also note that high permeability soils may enhance the potential for migration of vapors, and to point out that the heterogeneity of the surficial soil in the vicinity of the Site makes prediction of the probability of indoor air issues difficult.

Comment:

Section 6.1 – It is stated that the model domain was oriented in a roughly northwest direction to align the model rows with the general direction of bedrock strike. This should be clarified since bedrock strike in the area is northeast-southwest, with dip to the northwest at roughly 8 degrees.

Response:

The statement in the second paragraph of Section 6.1 is correct. The model is aligned in such a way that the model rows are parallel to the strike of the bedrock and columns are aligned to the northwest in the direction of dip.

Comment:

Page 6-8, Section 6.1 – In discussing the water levels collected at the Chemsol Superfund Site it is mentioned that the water levels were taken at "approximately the same time." Please give the actual date when the water levels were collected at the Chemsol Superfund Site.

Response:

The model was calibrated to water levels taken on the Site in October, 2000 (average of two rounds collected on October 5 and 24, 2000) and from the Chemsol Superfund Site on October 12, 2000.

Comment:

Section 6.1, Flow Modeling – Please include more detail on the model construction and calibration. This information may be more appropriate in an Appendix.

Response:

The preliminary model was intended to provide insight into the governing parameters of the hydrogeologic system, but not to present a fully calibrated model. Should a fully-calibrated model be developed, the details of its development, calibration, sensitivity analyses and verification will be presented.

Comment:

Page 6-8, Section 6.1 – It is stated that an anisotropy of 9 produced the best calibration results. What was the root mean square error (RMSE) when using an anisotropy of 9, and how did this compare to the RMSE for other anisotropies such as 6 and 3? Where there runs performed for higher anisotropies than 9 and what was the RMSE of these runs? This is important information to determine if an anisotropy of 9 is appropriate with the currently available information.

Response:

It was not the intent that the preliminary CSM be interpreted to conclude that an anisotropy of 9 produced the best calibration results. Rather, this value was used only for illustration purposes and is based upon the range of areal anisotropy commonly seen in the Passaic formation, which in our experience ranges from one to as high as 22. With an areal anisotropy of nine, the root mean square error (RMSE) was 0.531 ft. At this point in time, we cannot conclude that an areal anisotropy of nine is representative of conditions at the Site. Rather, aquifer testing and other studies of the Site will be used to determine the actual anisotropy of the aquifer.

Comment:

Section 6.1 – Some discussion should be included regarding the applicability of a porous flow model to a fractured bedrock aquifer. The discussion should also be included whether a "representative equivalent volume" has been established and whether the simulated scale actually represents a porous equivalency.

Response:

At the scale of the groundwater flow modeling, representation of the fractured Passaic formation aquifer as a porous medium equivalent is considered reasonable. The Passaic formation has been successfully modeled as a porous medium equivalent system with a systematic anisotropy to reflect the preferred direction of hydraulic conductivity caused by bedding plane and other fractures in the rock. A discussion of this aspect of the modeling has been included in Section 6.1.

FIGURES

Comment:

Several figures do not include scales and/or North arrows. The figures should be revised to include scales and North arrows.

Response:

The figures have been revised to include scales and North arrows.

Comment:

Figures 2 and 3 – the figures contain a contour for concentrations of "0 ug/L". Please revise this to more accurately reflect the concentrations that are being represented (i.e. non-detect).

Response:

The figure has been modified accordingly.

Comment:

Figure 4 – The icons used to identify TCE concentrations are virtually indistinguishable. Please revise the figure to include icons that can easily be distinguished so that TCE concentrations can be more easily identified.

Response:

The figure has been modified to make the icons more distinguishable.

Comment:

The title of Figure 5 should be changed from "Location of Other Potential Sources" to "Location of Other Sites". It is inaccurate to assume that all the identified sites are potential sources. For example, the Pitt Street Ground Water Contamination is an identified "site", it is probably not a "source" as the title of the figure would indicate.

Response:

Figure 5 has been modified accordingly.

Comment:

Figures 11 through 15 – Particles should not originate at specific sites. Instead, particles should be dropped in a location and frequency that describe the advective flow paths.

Response:

The particles were begun at specific sites only to illustrate the range of different flow paths occurring in the fractured rock aquifer based upon the areal anisotropy and the pumping rates at nearby water supply wells. It is not intended to suggest that these sites were responsible for impacts to groundwater. The names of the sites have been removed from the figures so that the illustrated flow paths simply represent a range of random starting locations.

CORNELL-DUBILIER ELECTRONICS
South Plainfield, New Jersey

PRELIMINARY CONCEPTUAL SITE MODEL (CSM)
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY

September 19, 2005
Revised February 2006
DANA.001.001.01A

CONTENTS

FIGURES

SECTION 1

INTRODUCTION

The Cornell-Dubilier Electronics, Inc. (CDE) Superfund Site, (EPA ID# NJD981557879) (the "Site") is located at 333 Hamilton Boulevard, Borough of South Plainfield, Middlesex County, New Jersey (Figure 1). The former CDE facility, now known as the Hamilton Industrial Park, consists of approximately 26 acres containing 18 buildings that are currently used by a variety of commercial and industrial tenants. EPA has divided the remediation associated with the Site into separate phases, or operable units. Operable Unit 1 (OU-1) consists of residential, commercial, and municipal properties located in the vicinity of the former CDE facility. Operable Unit 2 (OU-2) addresses the contaminated soils and buildings at the former CDE facility, including soils that may act as a source of groundwater contamination. Operable Unit 3 (OU-3), the focus of this report, consists of investigating the nature and extent of potential groundwater and soil vapor impacts. Operable Unit 4 (OU-4) will address contaminated sediments within the Bound Brook.

Dana Corporation entered into an *Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study* (Settlement Agreement) for OU-3 (Docket No. 02-2005-2024). The Settlement Agreement provides for a series of tasks for completion of a Remedial Investigation (RI) and Feasibility Study (FS), the first of which is the development of a preliminary Conceptual Site Model (CSM) as an aid for project planning. The objective of this document is to summarize and evaluate Site information obtained as part of prior site investigations (e.g., OU-1 and OU-2 work) and regional studies to develop a preliminary CSM. The preliminary CSM presented herein will be revised and updated as new information is obtained during the OU-3 investigation.

Section 2.0 describes the physical setting of the Site including Site history as well as current and proposed land use, while Section 3.0 discusses the Site geology and hydrogeology. Information related to potential contaminant sources, constituents of concern, and exposure pathways are discussed in Sections 4.0 and 5.0. The available data are then evaluated to develop the CSM presented in Section 6.0 and specific data needs are identified in Section 7.0

Figure 1
Site Location Map

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

SECTION 2

PHYSICAL SETTING AND LAND USE

2.1 SITE DESCRIPTION

The Site is located in the Borough of South Plainfield, northern Middlesex County, in the central portion of New Jersey. According to the 2002 Census, South Plainfield has a population of approximately 22,896 people with a total land area of approximate 8.4 square miles (city-data.com).

The Site consists of a fenced, 26-acre facility that is bounded on the northeast by the Bound Brook and the former Lehigh Valley Railroad, Perth Amboy Branch (presently Conrail); on the southeast by the Bound Brook and a property used by the South Plainfield Department of Public Works; on the southwest, across Spicer Avenue, by single family residential properties; and to the northwest, across Hamilton Boulevard, by mixed residential and commercial properties (See Figure 1). The surrounding area represents an urban environment with principally commercial and light industrial use to the northeast and east, principally residential development to the south and directly north, and mixed residential and commercial properties to the west.

The Site can best be described as two separate areas. The northwest, or developed area of the Site, is characterized by buildings and roadways, and comprises approximately 40 percent of the land area. Approximately 18 structures are located in this area, often subdivided into separate units that are leased to various tenants. In general, open areas on this portion of the Site have been paved as part of prior removal actions, with only small, fenced in areas of vegetation remaining. A system of catch basins is present throughout this area that channels stormwater flow to two outfalls along the Bound Brook. Investigations have indicated that some of the building interior floor drains also discharged to these catch basins.

The southeast, or undeveloped area of the Site, is predominately vegetated with a fenced semi-paved area in the middle. The Bound Brook flows from the eastern corner across the northeastern border of this area. Comprising approximately 60 percent of the land area, the undeveloped portion is separated from the developed portion by a chain-link fence with locked gates. The central area of this portion is relatively flat and is primarily an open field, with some wooded areas to the northeast and south and the semi-paved area in the middle. Beyond this area, the topography drops steeply to the northeast and southeast, and consists primarily of wetland areas bordering the Bound Brook. Elevations range from approximately 71 feet above msl at the top of the bank to approximately 60 feet above msl along Bound Brook.

2.2 SITE HISTORY AND PREVIOUS INVESTIGATIONS

The first recorded industrial use of the Site was by Spicer Manufacturing Corp., who owned and operated the facility from 1912 to 1929, after which it ceased operation in South Plainfield. Many of the buildings on the Site were constructed in 1918 to support Spicer's manufacture of various automobile industry parts such as universal joints, clutches, etc. Beginning in 1936, the property was leased to CDE, which manufactured electronic components from 1936 to 1962. In 1956, CDE purchased the property and owned it until 1962 when it was sold to D.S.C. of Newark Enterprises Inc. (DSC). Since DSC's purchase of the property, the former CDE facility, now known as the Hamilton Industrial Park, has been leased to an estimated 100 tenants and is currently used by a variety of commercial and industrial tenants. In December 2001, the South Plainfield Borough Council designated the Hamilton Industrial Park and certain lands in the vicinity of the industrial park as a "Redevelopment Area". The Borough retained a planning consultant to prepare a redevelopment plan for the designated area and has designated a developer to implement the plan.

Environmental conditions at the Site were first investigated by NJDEP in 1986. Since that time, sampling conducted by NJDEP and USEPA showed the presence of elevated levels of PCB's, VOC's and inorganics in Site soils, sediments and surface water. In 1997, USEPA conducted a preliminary investigation of the Bound Brook and also collected surface soil and interior dust samples from nearby residential and commercial properties. These investigations lead to fish consumption advisories for the Bound Brook and its tributaries. As a result of these sampling activities, the Site was added to the NPL in July 1998. In addition, based on data collected on and off-site, USEPA ordered several removal actions to be performed, as follows:

- In March 1997, EPA ordered DSC, as the owner of the facility property and a potentially responsible party (PRP), to perform a removal action associated with contaminated soil and surface water runoff from the facility. The removal action included paving driveways and parking areas in the industrial park, installing a security fence, and implementing drainage controls.

- In 1998, USEPA initiated a removal action to address PCBs in interior dust at houses to the west and southwest of the Site.

- In 1998, EPA ordered DSC and CDE to implement a removal action to address PCBs in soils at six residential properties located to the west and southwest of the Site. This removal action was conducted by CDE from 1998 to 1999.

- In 1999, EPA entered into an AOC with CDE and Dana to implement a removal action to address PCBs in soils at 7 residential properties located to the west and southwest of the Site. This removal action was conducted from 1999 to 2000.

- In April 2000, EPA entered into an AOC with DSC requiring the removal of PCB-contaminated soil from one additional property located on Spicer Avenue. DSC agreed to perform the work required under the AOC, but subsequently did not do so. In August 2004, EPA began the removal of PCB-contaminated soil from this property, and the work was substantially completed in September 2004.

In 2000, Foster Wheeler, under contract to USEPA, implemented a remedial investigation (RI) that included the collection of on- and off-site soil and sediment samples, on-site building surface samples, and on-site groundwater samples. These data were compiled in the *Data Evaluation Report for Cornell-Dubilier Electronics Superfund Site, South Plainfield, Middlesex County, New Jersey* (Foster-Wheeler, 2001). Subsequent to initiating the RI, USEPA divided the Site into three operable units (OUs): OU-1 addresses impacted properties in the vicinity of the Site; OU-2 addresses impacted on-site soils and buildings; and OU-3 addresses impacted groundwater. The RI and Feasibility Study (FS) for OU-1 were issued by USEPA in 2001. In June 2003, USEPA proposed a remedy for OU-1, and the Record of Decision (ROD) for OU-1 was issued on September 30, 2003. The selected remedy projects the removal of approximately 2,100 cubic yards of impacted soils from neighboring properties as well as indoor dust remediation where PCB contaminated dust was encountered. Additional sampling (soil and dust) is also planned to determine if further remediation is required

The RI Report for OU-2 was issued in August 2001. The FS for OU-2 was then issued in April 2004, and the ROD was issued in September 2004. The remedy specified in the ROD contemplates the excavation and on-site treatment and/or off-site disposal of an estimated 107,000 cubic yards of soils containing PCB concentrations greater than 500 ppm, or other contaminants containing concentrations above New Jersey's Impact to Groundwater Soil Cleanup Criteria (IGWSCC), plus an additional estimated volume of 7,500 cubic yards of contaminated soil and debris from the capacitor disposal areas. Following excavation, the Site will be regraded and capped. Demolition of the 18 on-site buildings will also be completed with appropriate off-site disposal of the debris.

Completion of the remedial actions identified for OU-1 and OU-2 is currently pending.

SECTION 3

GEOLOGY AND HYDROGEOLOGY

3.1 GEOLOGY

The Site lies within the Piedmont Physiographic Province and is underlain by a relatively thin layer of soils comprised of quarternary glacial deposits and artificial fill. These unconsolidated deposits overlie the late Triassic to early Jurassic Age Passaic Formation (formerly Brunswick Formation) of the Newark Group.

The overburden soils range in thickness from 0.5 to 15 feet and generally thicken towards the Bound Brook. The natural soils represent a mix of red-brown silt and sand as well as silt and clay layers, with a generally consistent weathered siltstone unit immediately above bedrock that consists predominantly of red-brown silt to fine sand, with sub-rounded to angular, fine to coarse siltstone gravel and silty clay. This weathered zone interfingers with urban fill material at a number of locations on the Site. The fill material generally consists predominately of cinders, ash, brick, glass, metal, slag, and wood fragments.

The top of the consolidated Passaic Formation bedrock generally ranges from 4 to 15 feet below ground surface, except in the far northwest corner of the Site, where bedrock is found immediately underlying the building slabs. The surface of the bedrock generally slopes to the south-southeast and consists of red-brown to purplish-red mudstone and siltstone with localized beds of fine-grained sandstone. These sedimentary units generally strike to the northeast and dip between 5 and 15 degrees to the northwest, with primary fracture patterns both parallel and perpendicular to bedding (Lewis-Brown and dePaul, 2000). Rock cores collected on-site were noted to contain heavily fractured zones, generally occurring along bedding planes.

3.2 HYDROGEOLOGY

The thin unconsolidated materials overlying bedrock exhibit discontinuous zones of perched water that do not constitute an aquifer at the Site. These discontinuous zones of perched water occur frequently where unconsolidated natural and fill materials of variable composition interfinger. The depths of the perched zones are variable across the Site, although they typically occur in the range of 4 to 8 feet below ground surface. In comparison, the potentiometric surface of the shallow bedrock, the regional water table, typically ranges from 11 to 20 feet below ground surface. The layers of silt, clay, and weathered siltstone, comprising the overburden/top of bedrock zone, provide the relative resistance to vertical flow that allows these perched zones to occur during sufficiently wet periods.

The underlying Passaic Formation represents a multi-unit leaky aquifer system that consists of interbedded siltstone, mudstone and shale. Groundwater flow within the Passaic Formation is primarily through secondary permeability associated with interconnected fractures. By comparison to this secondary permeability, the unit, as a result of compaction and cementation, has limited porosity and permeability. The upper 50 to 60 feet of the Passaic, however, is typically weathered such that the fractures are generally filled with low permeability silt and clay that limits the hydraulic conductivity of this zone. This upper weathered zone is typically unconfined and represents the upper most contiguous water-bearing zone beneath the Site. Below this zone, the Passaic is typically semi-confined and can yield significant quantities of water. Groundwater flow is controlled by the degree of fracturing and the anisotropy of the formation, which results from the typically higher values of hydraulic conductivity along the direction of strike (generally to the northeast). The magnitude of this anisotropy can play a significant role in controlling groundwater flow direction.

Mapping of the potentiometric surface within the upper weathered zone beneath the Site suggests groundwater flow to the northwest. In addition, stream gauge measurements in the Bound Brook typically indicate higher head levels than those in nearby bedrock wells, suggesting that the Bound Brook is recharging the upper bedrock aquifer and does not represent a groundwater discharge point. The groundwater discharge point for the Passaic formation is likely represented by the large number of municipal water supply wells located north of the Site along a broad swath of the aquifer located south of the Watchung Ridge.

SECTION 4

POTENTIAL CONTAMINANT SOURCES AND CONTAMINANTS OF POTENTIAL CONCERN IN GROUNDWATER

Potential contaminant sources and contaminants of potential concern in groundwater are discussed below in relation to both the Site and other potential sources. Impacts to off-site properties, on-site soils and buildings, and sediments are being addressed by EPA as part of separate operable units.

4.1 SOURCES ON THE CDE SITE

During the period of its operations, CDE is reported to have disposed of PCB-contaminated materials and other substances directly on the facility soils, and previous Site investigations indicate elevated concentrations of VOCs, SVOCs, PCBs, and metals in the on-site sub-surface soils and sediments. Groundwater analytical results indicate elevated levels of VOCs and PCBs, with PCBs present likely as a result of cosolvency effects due to high VOC concentrations as well as suspended solids. Soils containing elevated levels of VOCs and PCBs thus appear to represent a source to groundwater. However, metals found at elevated levels in the soils were not found in the groundwater. Therefore, soils impacted by metals do not appear to be a source to groundwater. SVOCs detected in soils were also not routinely detected in groundwater and also do not appear to be a source to groundwater.

Compounds detected in groundwater beneath the Site include the following:

Compound	Minimum Detected Concentration (PPB)	Maximum Detected Concentration (PPB)	Frequency of Detection
Volatile Organics (VOCs)			
Trichloroethene (TCE)	17	120,000	12/12
Cis-1,2-Dichloroethylene	2	190,000	12/12
Tetrachloroethene (PCE)	12	520	3/12
Vinyl Chloride	9	160	3/12
1,2,4-Trichlorobenzene	1,200	1,200	1/12
Semi-Volatile Organics (SVOCs)			
Naphthalene	5	5	1/12
Bis(2-Ethylhexyl) phthalate	1	1	1/12
Pesticides and PCBs			
beta-BHC	.016	.016	1/12
delta-BHC	.074	.074	1/12
Aldrin	.022	1.3	9/12
PCB – Aroclor 1232	.53	80	9/12
PCB – Aroclor 1254	4.1	9.2	4/12

Note: Inorganics (metals) found at elevated concentrations in the soils were not elevated in groundwater. Inorganics were detected as naturally occurring elements.

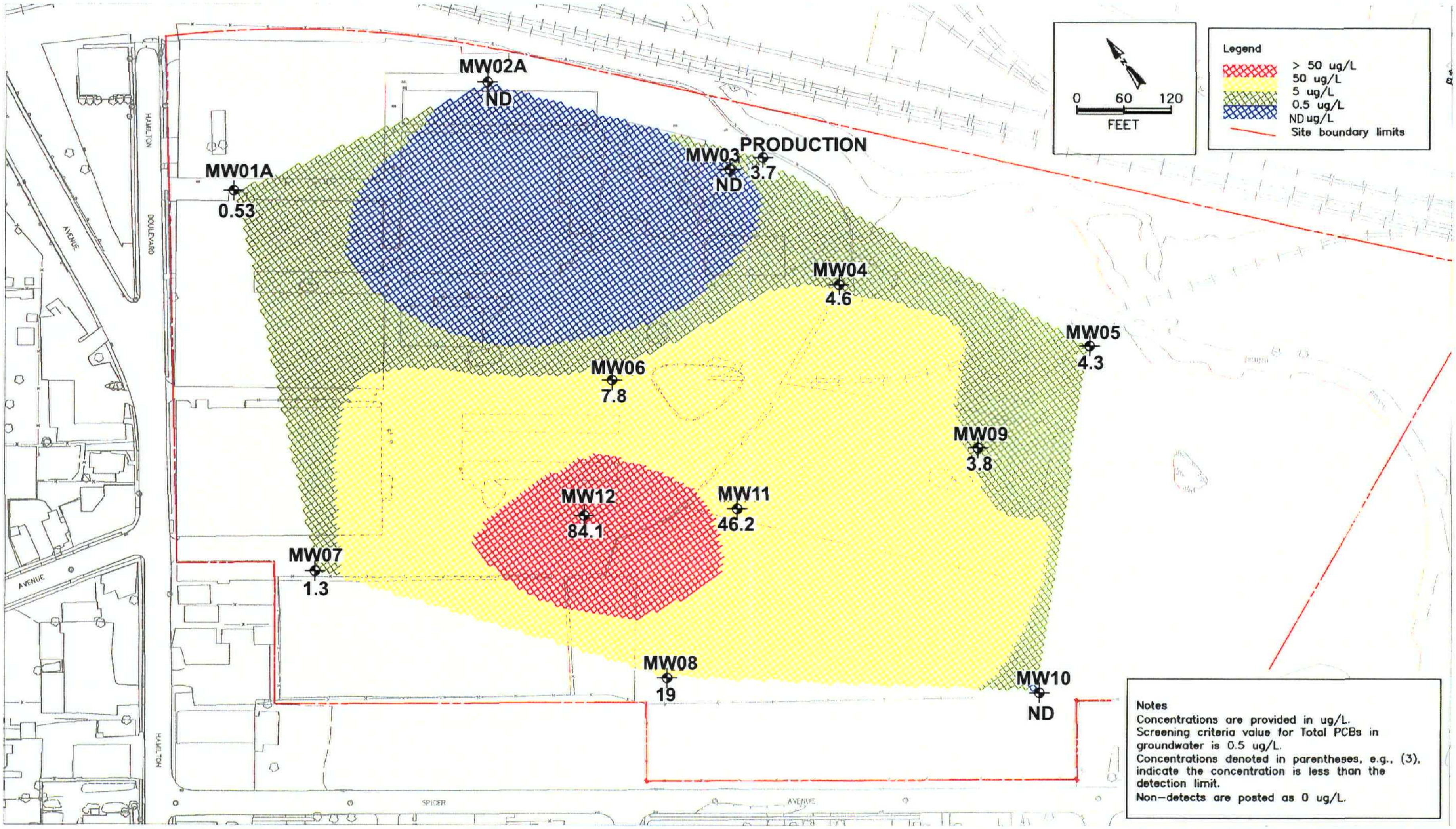
As summarized above, trichloroethene (TCE) and its degradation product cis-1,2-dichloroethene (Cis-1,2-DCE) represent the compounds most frequently detected and at the highest reported concentrations on the Site, followed by PCBs and the pesticide aldrin. The distribution of PCBs and VOCs in shallow bedrock groundwater beneath the Site is illustrated in Figures 2 and 3 respectively.

As discussed previously in Section 3.0, work completed to date indicates that surface water elevations in the Bound Brook are above the potentiometric surface in nearby bedrock wells. These data indicate that groundwater does not discharge to the Bound Brook. Therefore, impacts to sediments in the Brook are unrelated to groundwater and are likely related to surface water runoff and discharge from the Site's interconnected floor drains and stormwater catch basins that discharged to two locations along the Bound Brook. PCBs, VOCs, SVOCs, pesticides, and metals were detected in sediment and standing water samples collected from these catch basins. Previous Site stabilization measures (i.e., paving and silt fencing) that were implemented by the property owner in 1997 addressed the potential for Site contaminants to reach the Bound Brook via overland runoff and through the facility drainage system discharges.

4.2 OTHER POTENTIAL SOURCES

Investigations by NJDEP between January 1987 through October 1990 identified the presence of chlorinated solvents, most notably trichloroethene (TCE) and tetrachloroethene (PCE), in residential wells located to the south, southwest and west of the Site (Pitt Street Private Well Study Area). The distribution of TCE in bedrock groundwater, the most frequently detected constituent, is illustrated in Figure 4. Other detected VOCs included the PCE/TCE breakdown products of 1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride as well as 1,1,1-trichloroethane, carbon tetrachloride, methyl-tert-butyl ether (MTBE), chloroform, and xylene.

The sources of the VOCs identified above have not been determined. However, searches of the NJDEP Comprehensive Site List (CSL) and Environmental Data Resources Inc. (EDR) databases yield over one hundred sites within approximately 1 mile of the Pitt Street Private well area that may be considered as potential sources of VOCs in groundwater. Sites in the area at which chlorinated solvents have been detected include, but are not limited to, Mary Kay Cosmetics, Prosoco Inc., Hummel Chemical, Asarco, Modulume, and others. Groundwater investigations at several different facilities in the area by various consultants have identified a regional groundwater problem in the South Plainfield area with much of the area to the southwest of the CDE Site identified by NJDEP as a classification exception area (CEA) (Figure 5).

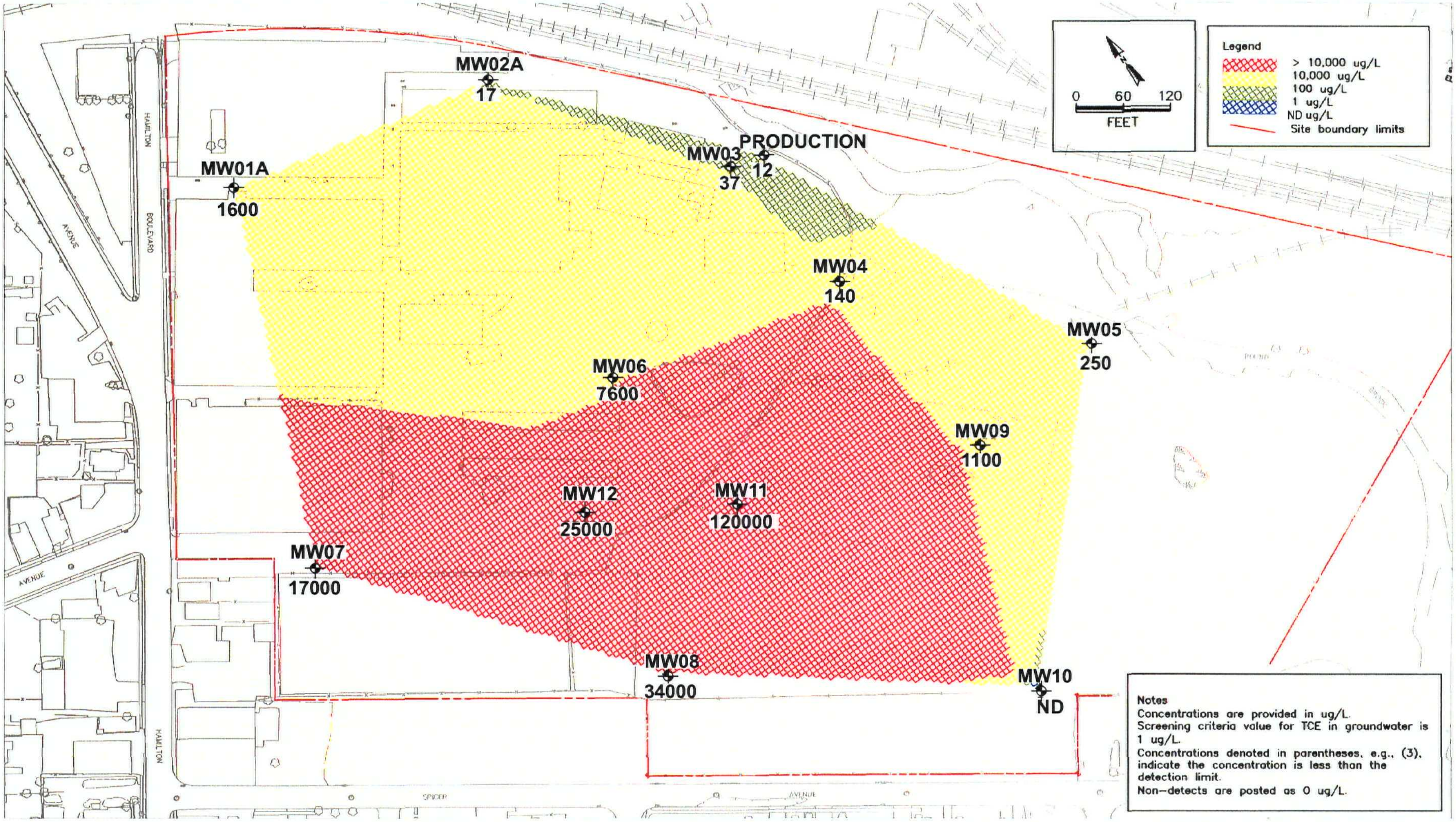


Source: "Remedial Investigation for Operable Unit 2, Cornell-Dubilier Electronics, Inc. Superfund Site. Foster Wheeler Environmental Corporation, August 2001.

Figure 2
PCB's in Shallow Bedrock Groundwater

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

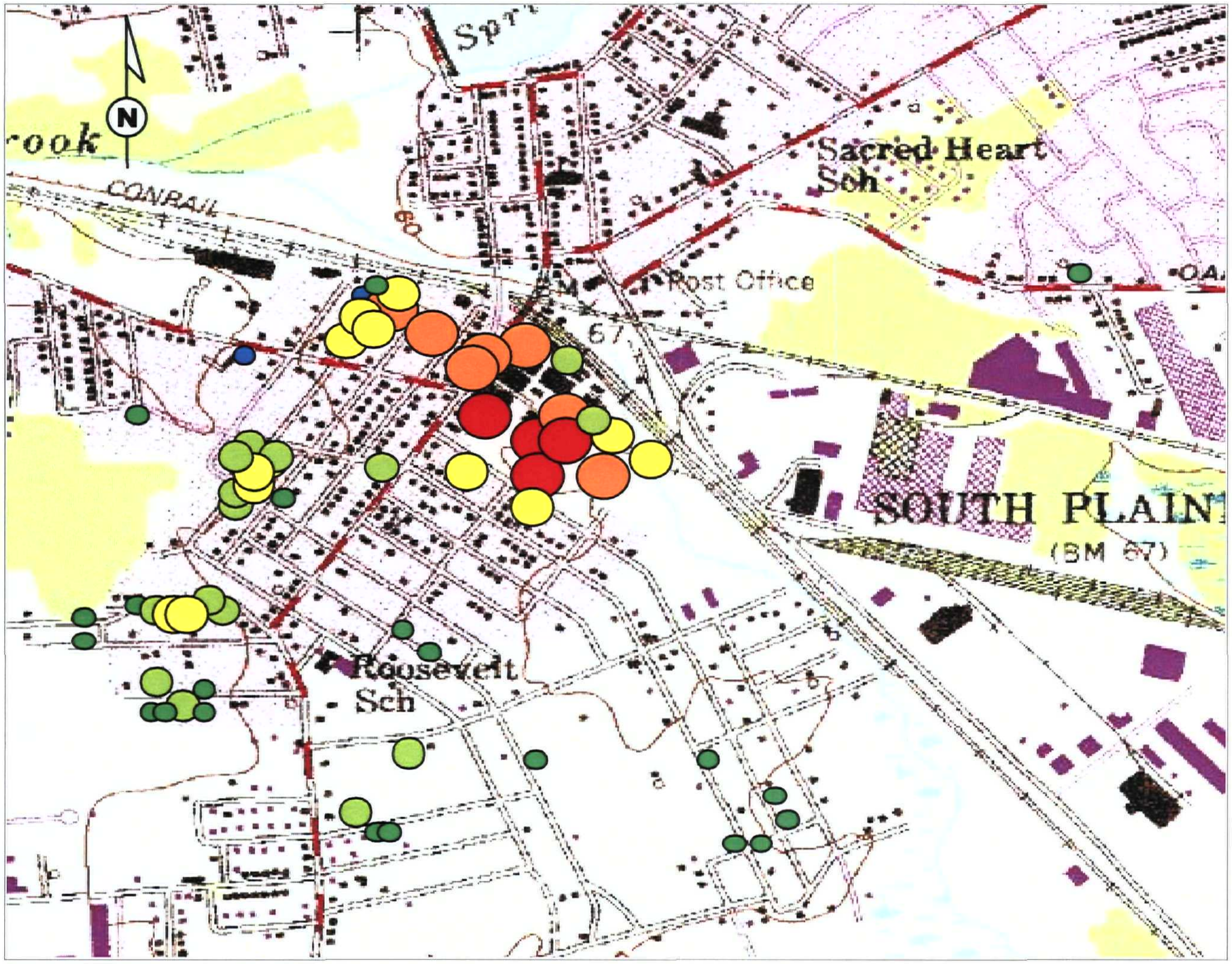


Source: "Remedial Investigation for Operable Unit 2, Cornell-Dubilier Electronics, Inc. Superfund Site. Foster Wheeler Environmental Corporation, August 2001.

Figure 3
VOC's in Shallow Bedrock Groundwater

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey



LEGEND

TCE Levels

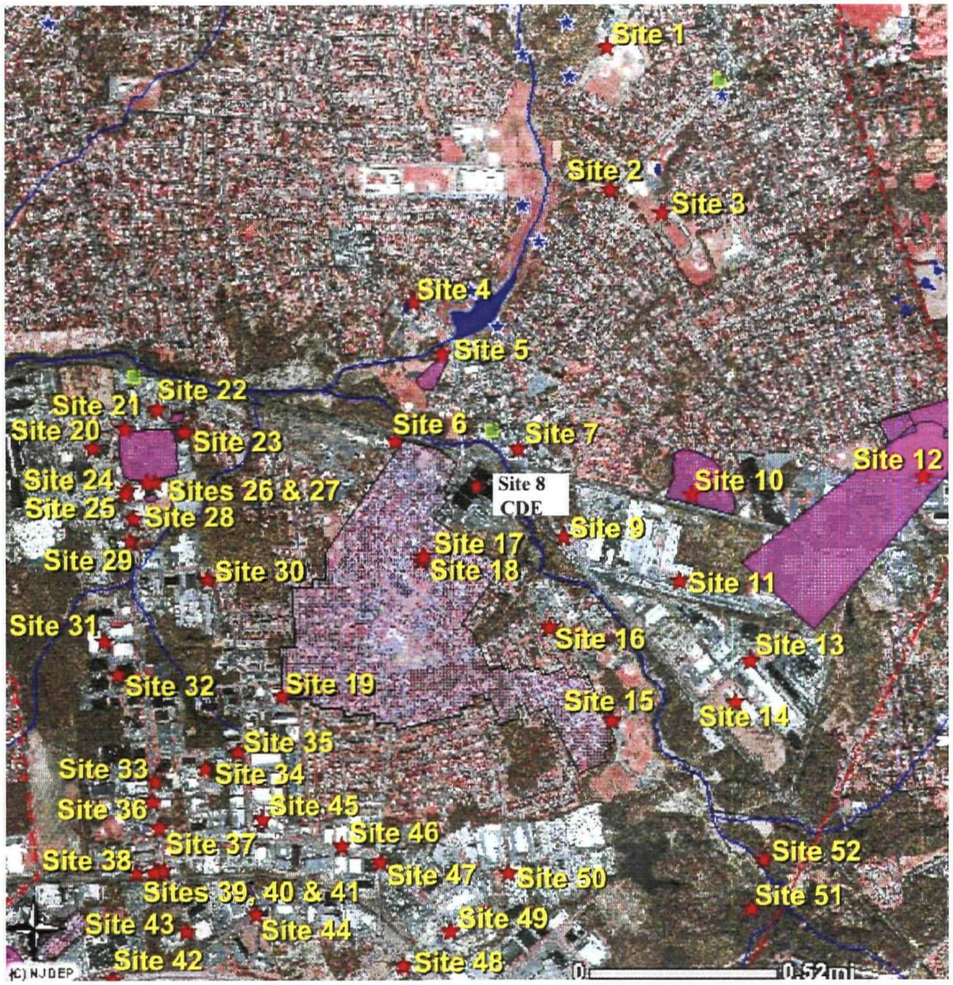
- **<1.0 ug/l**
- **1.0-10 ug/l**
- **10-100 ug/l**
- **100-1,000 ug/l**
- **1,000-10,000 ug/l**
- **>10,000 ug/l**

Approximate Scale: 1 in = 1700 ft

Data taken from Plate 3 "Half Mile Radius Ground Water Well Location Map, ENVIRON, 2/8/05

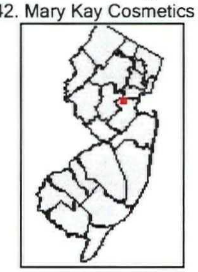
Figure 4
TCE Levels in Bedrock Groundwater

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey



NJDEP Mapped Known Contaminated Sites

1. South Plainfield Senior Citizens Center
2. Middlesex Water Co. Wellfield Contam.
3. Jost Field House
4. South Plainfield Borough
5. Shell Service Station South Plainfield
6. Crown Bullion & Refining Company
7. Nischwitz & Company
8. Cornell Dubilier Electronix Inc.
9. Itran Corporation
10. Halls Warehouse Corporation
11. CP Manufacturing Inc.
12. Asarco Inc.
13. United Steel Deck Company
14. Chevron Chemical Company Ortho Division
15. South Plainfield Sanitary Landfill
16. Board of Education Municipal Yard
17. Pitt Street Ground Water Contamination
18. BP Service Station South Plainfield Borough
19. Prosoco Company Inc.
20. Loose Leaf Industries Inc.
21. Degussa Huls Corporation
22. RAD Corporation
23. Kern Foam
24. Barclay Brand Corporation
25. Eco Pump Corporation
26. CF Motor Freight
27. Hmieleski Trucking
28. Degussa Huls Corporation
29. SGM Armtek Inc.
30. Alfred Conhagen Inc.
31. Flagship Cleaning Services Inc.
32. Federal International Chemicals
33. L & R Metal Treating Company
34. Therma Plate Corporation
35. Tevco Inc.
36. Degussa Huls Corporation
37. 4201 Clinton Avenue South
38. Brooks Industries Inc.
39. Brooks Industries
40. Ultrakleen Services Inc.
41. Platina Refining Labs
42. Mary Kay Cosmetics Inc.
43. Synergy Gas
44. Absolute Fire Protection Company Inc.
45. Snyder Foundation Inc.
46. Lynn Steel Corp.
47. Boro Auto Wreckers Inc.
48. Amoco Service Station South Plainfield
49. Crisdel Construction Company
50. Saint Johnsbury Truck Terminal
51. Woodbrook Road Capacitor Site
52. South Plainfield Superfund Site



Legend

- Known Contaminated Sites List (2001)
- Public Community Water Supply Wells
- Place Names
- Municipalities
- Counties
- Streams
- Water Bodies
- Deed Notice Areas
- Groundwater Contamination Areas (CEA)
- Groundwater Contamination Areas (CKE)

Aerial Photos 2002

New Jersey

Figure 5
Location of Other Potential Sources

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

4.3 CONTAMINANTS OF POTENTIAL CONCERN

On the basis of existing data, the contaminants of potential concern related to groundwater include primarily VOCs, PCB's, and potentially pesticides. More specifically, the VOCs of interest related to bedrock groundwater include the following:

Compound	Highest Concentration (ppb)	Location	Comments
TCE	120,000	MW-11 – CDE Site	Most common VOC*
PCE	3,800	MW-2D – Mary Kay	520 ppb at CDE
Vinyl Chloride	160	MW-01A – CDE Site	
Cis-1,2-DCE	190,000	MW-11 – CDE Site	
1,2,4-Trichlorobenzene	1200	MW-12 – CDE Site	Not reported elsewhere
Chloroform	36	450 Oak Tree Ave	Not reported at CDE
Carbon Tet.	7.6	450 Oak Tree Ave	Not reported at CDE
1,1,1-TCA	60	310 Pitt Street	Not reported at CDE
1,1-DCE	129	310 Pitt Street	Not reported at CDE
Toluene	180	111 Snyder Rd.	Not reported at CDE
MTBE	4.3	702 Hamilton	Not analyzed at CDE

* TCE is detected in wells throughout the area.

Other contaminants not specifically identified above were sporadically reported at various locations. However, the above list represents those most commonly reported, with TCE routinely detected throughout the area, followed by PCE (albeit less frequently). PCB's were also reported in bedrock groundwater in monitoring wells completed on the Site. PCB's have not been tested for during other studies performed outside the boundaries of the CDE property.

4.4 CONTAMINANT FATE AND TRANSPORT

The chlorinated solvents identified above as contaminants of potential concern, when introduced to the subsurface, will initially migrate as a dense non-aqueous phase liquid (DNAPL) independent of groundwater flow direction. The extent and direction of migration will depend on the volume of contaminant released to the subsurface, the density of the contaminant, the porosity of the surrounding soil and rock, fracture orientation, and solubility of the individual contaminants. At the Site, the principal constituents consist of chlorinated solvents (DNAPLs) which will tend to migrate along the top of lenses of lower permeability silt and clay materials and vertically downward along preferential pathways associated with bedrock fractures and bedding planes. As the chlorinated solvents migrate through the subsurface, the solvent coats the surrounding soil, is trapped within dead end fractures, and is diffused into the surrounding rock matrix, until the available mass is exhausted (i.e., all of the free product has been attenuated on soil particles, trapped in fractures or diffused into the rock matrix). Studies conducted at the University of Waterloo and at other sites suggest that in fractured sedimentary rock such as the Passaic Formation, the free product is often diffused into the rock matrix within the course of several years to several decades. This research, plus experience at other sites underlain by the Passaic Formation, suggests that most, if not all, of the DNAPL that entered the fractured rock would have diffused into the rock matrix, and that free product is not likely present. Nonetheless, subsequent investigative efforts will seek to evaluate this hypothesis and the potential for residual product to be present.

DNAPL that has diffused into the rock matrix, serves as a long term, ongoing source of dissolved VOCs as they diffuse back out of the rock matrix and are dissolved into groundwater flowing through the fracture system within the bedrock. These dissolved VOCs are then transported with groundwater flow to downgradient locations. The dissolved VOCs are attenuated, to some degree, by diffusion into the surrounding rock matrix. In addition, under favorable conditions, biological and to some extent abiotic dechlorination can occur wherein the chlorine bonds within the VOC compounds are successively broken to form non-toxic compounds such as ethene and ethane. These mechanisms, along with advection and diffusion, serve to reduce the concentrations at the leading edges of the groundwater plume to drinking water standards and eventually to non-detectable levels of VOCs. There is evidence of dechlorination occurring at the Site as indicated by the presence of cis-1, 2-DCE in the groundwater, a constituent that is not a product of commerce and, therefore, indicates an in-situ dechlorination process.

PCBs are typically not very mobile in the subsurface in dissolved form due to their low solubility and their high partition coefficients, which make them tend to more readily adhere to the surrounding soil and rock matrix as opposed to being transported with groundwater. As a result, dissolved plumes of these compounds are typically less extensive than those associated with VOCs. However, the presence of solvents (VOCs) at high concentrations can enhance the solubility of PCB's and facilitate transport with groundwater to greater distances than would be expected without the presence of high concentrations of VOCs.

Given the above, as part of the identification of the Site as a source of off-site groundwater impact, one would expect to find the specific compound of interest at the highest concentration within the property boundaries. Evidence of residual saturation of NAPL has been observed in overburden at the Site. Some evidence of NAPL has also been observed on rock core from MW-11. The highest concentrations of contaminants, whether due to dissolution of residual NAPL or diffusion out of the rock matrix, will tend to occur near the sources of the contamination on the Site. Concentrations would then be expected to decline with distance along the downgradient flow path, with the extent of PCB impacts limited in comparison to the VOC plume. Concentrations detected outside the anticipated groundwater flow paths are likely associated with other sources unrelated to the Site. Likewise, compounds unrelated to the Site or at concentrations inconsistent with the surrounding concentration gradients, or in locations inconsistent with hydraulic gradients, would also be suggestive of an alternative source. As discussed previously, the available data suggest that other sources (of TCE and other VOCs) are present and that TCE impacts to groundwater may be part of a regional issue. However, the possibility also exists that groundwater flow paths may have varied over time, possibly because of variability of pumping for water supply, and such variability could also affect the understanding of source and distribution of contaminants. This possibility will be evaluated as additional data are collected.

4.5 CONTAMINANT VARIABILITY

As illustrated in Figure 4, and the table above, the concentration of the principal contaminant of potential concern, TCE, is highest at the Site. However, significant concentrations (100 ppb or greater) of TCE have also been detected to the west-southwest and southwest of the Site along Pitt Street and New York Ave, respectively. In addition, concentrations of TCE of less than 10 ppb are interspersed with these higher concentrations and at other locations throughout the surrounding area. Further, other VOCs such as MTBE, 1,1,1-TCA, and others, are detected at various locations throughout the surrounding area but not at the Site.

The widespread occurrence of TCE and the presence of VOCs that are not reported at the Site suggest the presence of other contaminant sources and a regional impact to groundwater unrelated to the Site. However, it is also important to recognize that some of the spatial variability could be related to historical groundwater flow patterns, as noted above. An understanding of groundwater use in the area, through time, will thus be a relevant consideration.

Variability in concentrations within short distances should also be anticipated in a fractured rock aquifer. The reported concentrations will depend on how well the fractures intercepted by any given well are hydraulically connected to the surrounding rock.

The variability of concentrations through time cannot be currently evaluated with the available data. Additional rounds of water quality samples will be collected as part of the Remedial Investigation, which will allow comparison to previously collected data.

4.6 CONTAMINANT SUSCEPTIBILITY TO TREATMENT

Various remedial alternatives exist to treat, in-situ or ex-situ, and/or contain the contaminants of potential concern identified at the Site. More specifically, dissolved VOCs, which are the principal contaminant of concern, can be addressed through conventional groundwater extraction and treatment with air stripping, activated carbon, and other technologies or in-situ treatment through enhanced bioremediation, air sparging, chemical oxidation, permeable reactive barriers, monitored natural attenuation, etc. Other constituents that may be present, such as SVOCs and PCBs, can also be treated by conventional means (e.g., carbon adsorption, chemical precipitation, filtration), but may be generally less amenable to in-situ treatment.

Several of the available technologies, such as permeable reactive barriers or thermally enhanced recovery, are generally not applicable to bedrock settings or to the depths likely required at this Site. More significantly, these technologies only treat the dissolved portion of the plume and do not address the long term, ongoing source of VOCs that have diffused into the rock matrix. At this time, there is currently no technology that is proven to address constituent mass in the rock matrix. Research is currently underway using permanganate (a long-lived oxidant) for oxidation of chlorinated alkanes and alkenes within the rock matrix by providing sufficient oxidant for diffusion into the matrix. However, to date, such technology has not been proven on a full-scale basis. The rate of mass reduction may ultimately be related solely to the rate of matrix diffusion, which has been shown to be on the order of hundreds of years. Remedial actions proposed for this Site must, therefore, address the issue of matrix diffusion as part of the Feasibility Study.

SECTION 5

EXPOSURE PATHWAYS AND RECEPTORS

Exposure pathways related to soil and dust have been addressed during previous remedial activities and are not addressed herein. Exposure pathways related to bedrock groundwater include exposure to VOC vapors migrating to indoor air from an underlying groundwater plume, exposure to volatile organic vapors from use of impacted groundwater, and ingestion of impacted groundwater. As noted previously, and to be further confirmed during the RI for OU-3, bedrock groundwater does not appear to discharge to surface water. Therefore, it maybe that the groundwater to surface water pathway is not complete. Potential receptors include individuals working or living (residents) in the area overlying or near groundwater containing elevated levels of VOCs (and to a lesser degree SVOCs and PCBs) and/or those that use impacted groundwater from private wells for drinking, cooking, bathing, irrigation, etc.

Exposure to VOC vapors can occur if groundwater containing elevated concentrations of VOCs is migrating in the vicinity of or beneath a structure and permeable unsaturated soils are present. The extent to which vapor migration impacts indoor air is related to VOC concentrations in the underlying groundwater, permeability and moisture content of the unsaturated zone soils, and construction of the dwelling. The presence of low permeability soils between the impacted groundwater and the dwelling may significantly reduce or eliminate the potential for impacts to indoor air. In contrast, the presence of high permeability soils may increase the potential for vapor migration from groundwater that can lead to a higher probability of vapor intrusion. The presence of shallow uncontaminated groundwater overlying contaminated groundwater may also preclude impact to indoor air. The heterogeneity of the surficial soils in the vicinity of the Site makes prediction of the probability of indoor air issues difficult.

Exposure to volatile organic vapors, through ingestion, inhalation, or dermal contact, can occur if impacted groundwater is pumped to the surface for typical use consisting of drinking, cooking, bathing, irrigation, etc. As a result of the NJDEP investigations completed in 1990, residences and businesses in the area were connected to public water supplies. Accordingly, this pathway has been addressed previously and private groundwater use is not expected. The nearest known use of groundwater is associated with the public water supply wells located north of the CDE Site near Spring Lake. An updated well inventory is currently underway, in accordance with Paragraph B. 6. of the Settlement Agreement, Statement of Work. As of the preparation of this preliminary CSM, well inventory data from the New Jersey Department of Environmental Protection (NJDEP) and the Middlesex Water Company were not complete. County and local offices (e.g. health department, engineering department, public works, etc) were also contacted to identify wells, but do not maintain well records. As the data on water supply wells become more complete and work proceeds on the RI/FS, this preliminary CSM will be updated, as appropriate.

SECTION 6

CONCEPTUAL SITE MODEL (CSM)

The Conceptual Site Model (CSM) represents an evolving understanding of the Site hydrogeology, groundwater flow, and contaminant migration based upon the body of knowledge at any given time. At this time, the hydrogeologic setting and the current CSM are characterized by the following:

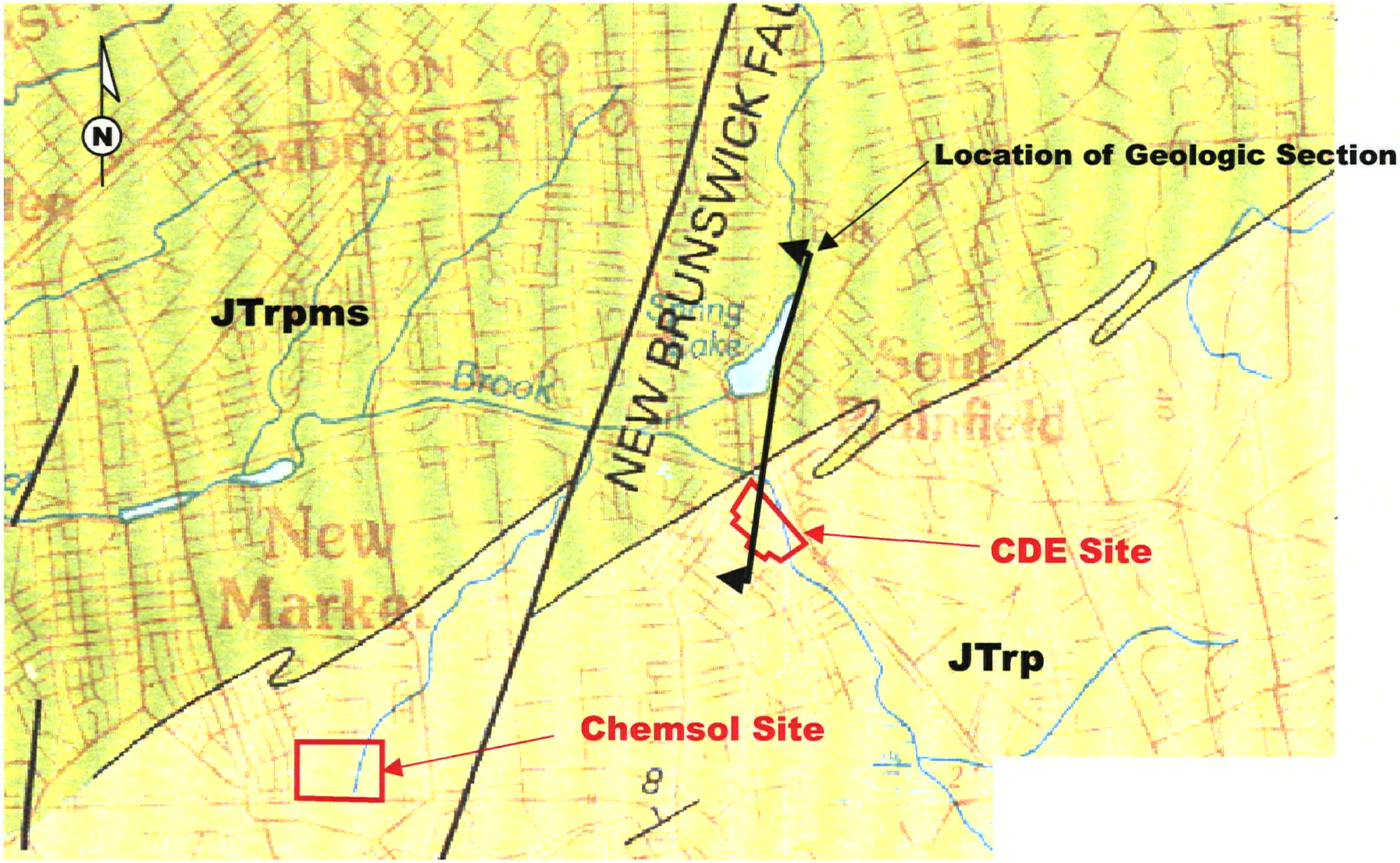
- The overburden in the area of the Site is relatively thin and largely unsaturated, and is comprised of low permeability soils.

- Existing data indicate that the surface water elevation of the Bound Brook and surrounding wetlands is above the potentiometric surface of the underlying Passaic Formation bedrock. Further investigations will aid in developing a better understanding of the interrelationship between Bound Brook, nearby wetlands, and groundwater flow within the Passaic Formation. Preliminary data suggest that the likely ultimate discharge point for bedrock groundwater is the extensive array of groundwater supply wells to the north. Further studies will seek to further evaluate this preliminary assessment.

- The Site is underlain by fractured rock of the Passaic Formation as illustrated in Figure 6. The rock in this area strikes roughly northeast/southwest and dips to the northwest at about 8 degrees.

- The upper 30 to 50 feet of the Passaic Formation is typically weathered and of generally low permeability. However, at greater depth, the Passaic Formation serves as a major water supply aquifer in the area. Numerous water supply wells are situated north of the Site along a broad swath of the aquifer south of the Watchung Ridge. These wells, along with their well head protection areas, are depicted on Figure 7. Pumping of these wells (rate, duration, zone/depth) can have a significant impact on groundwater flow direction.

- The closest of these water supply wells are the three Middlesex Water Company wells at Spring Lake. The southernmost of these wells are less than 2,000 feet from the Site. The location of these wells relative to the Site is illustrated in Figure 8, which depicts a northwest cross-section through the Site and the two water supply wells along the east side of Spring Lake.



Approximate Scale: 1 in = 3425 ft

Legend

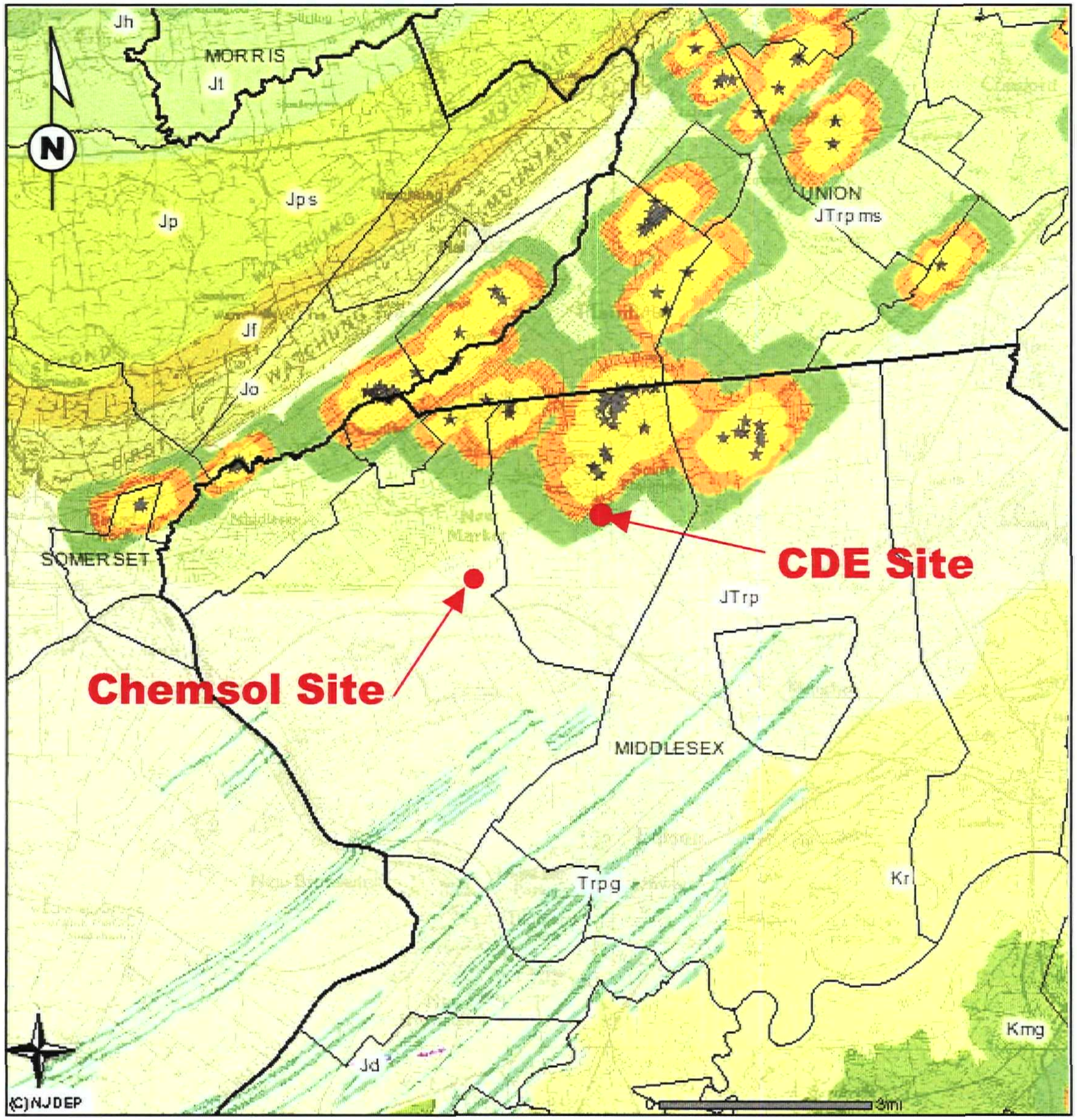
Mudstone Facies of Passaic fm	
Passaic fm	

8 — Dip in Degrees

Strike of Formation

Figure 6
Bedrock Geologic Map

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey



LEGEND:

Water Supply Wells

Well Head Protection Areas:

2-year zone of capture

5-year zone of capture

12-year zone of capture

Figure 7
CDE Site Location Relative to Major Water Supply Wells and Well Head Protection Areas

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

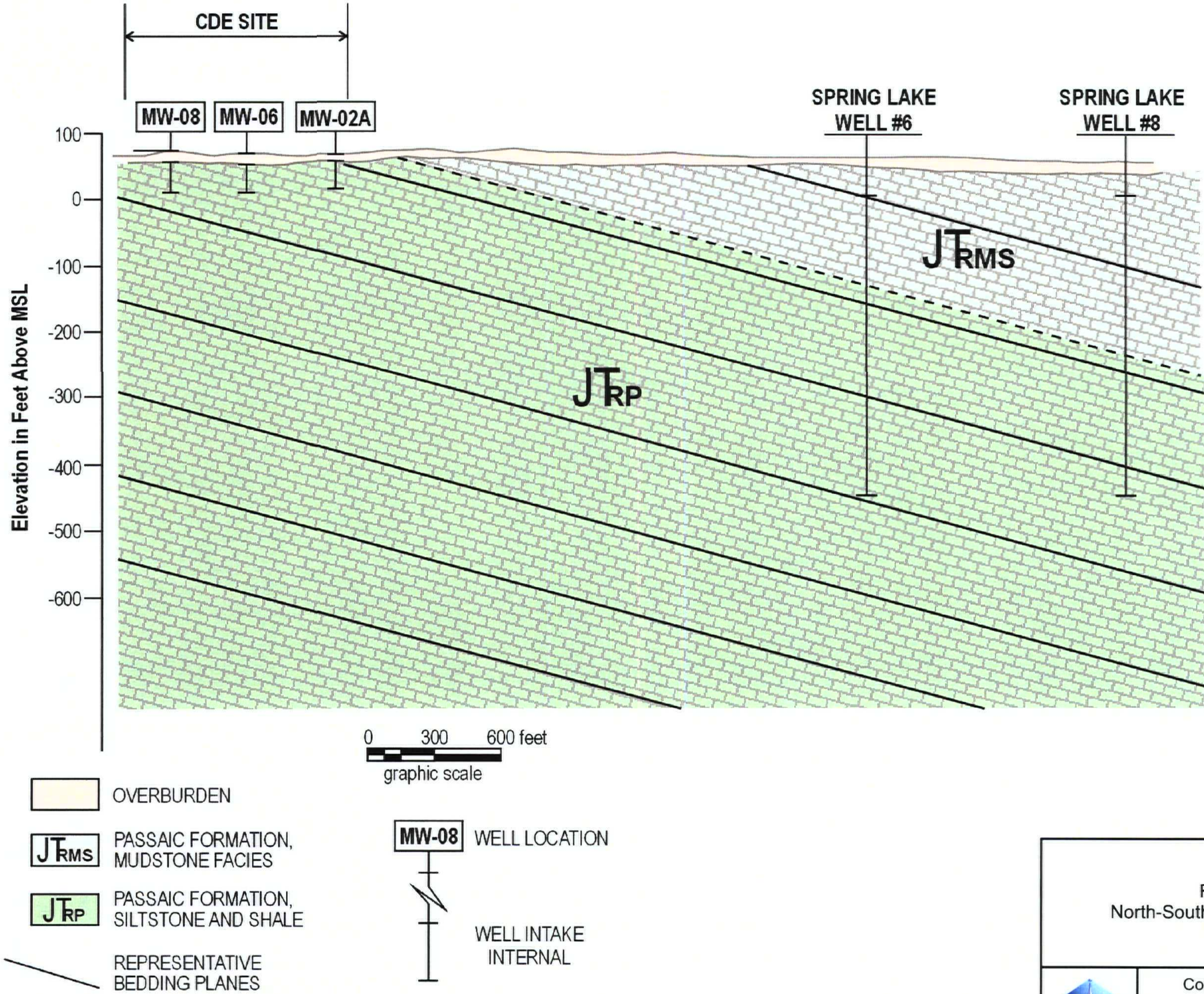


Figure 8
North-South Geologic Section

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

- The Passaic Formation often exhibits a higher hydraulic conductivity along the direction of the bedding plane strike, which in this case is roughly northeast/southwest. This common characteristic of the Passaic Formation (as well as many other fractured rock aquifers) is referred to as areal anisotropy and is an important factor in controlling groundwater flow direction in this aquifer. As described in greater detail below, the magnitude of this anisotropy is an important factor in understanding groundwater flow direction.

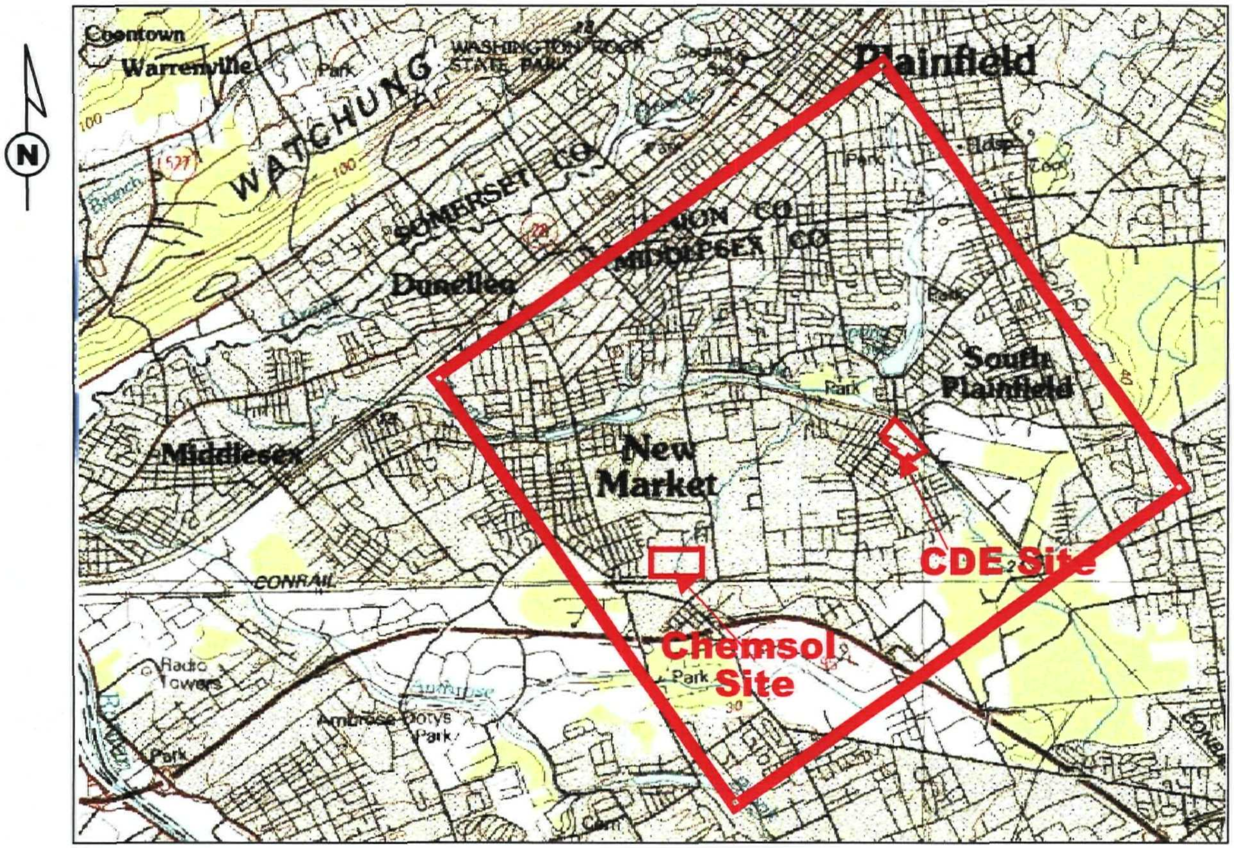
- The Passaic Formation is composed of porous sandstone, shale and mudstone. Consequently, matrix diffusion of contaminants into and out of the rock's matrix will be a key factor governing contaminant migration in this formation.

- TCE and other solvents are widespread within the Passaic Formation aquifer in this area as discussed previously in Section 4.0. While the Site exhibits significant levels of TCE in its groundwater monitoring well network, there are also significant outlying areas of TCE contamination, and other solvents, in former private water supply wells. The source(s) of these outlying areas of contamination is unclear at this point and their relationship to the contaminants emanating from the Site will be clarified during the RI/FS.

6.1 PRELIMINARY GROUNDWATER FLOW MODELING

A preliminary groundwater flow model has been developed to provide insight into the hydrodynamics of the aquifer and the key parameters that govern groundwater flow and contaminant transport. Although unrefined at this time, completion of a preliminary groundwater flow model prior to conducting the site hydrogeologic investigation provides valuable insight to assess key data needs and to further the understanding of the CSM. Based on existing data collected from the Site, as well as data from the Chemsol Superfund Site located approximately 1.5 miles to the west, a preliminary model has been developed using Visual MODFLOW-Pro developed and marketed by Waterloo Hydrologic.

The groundwater flow model domain is illustrated in Figure 9. The model domain is 20,000 ft x 20,000 ft and has been oriented in a roughly northwest direction to align the model rows with the general direction of the strike of the bedrock. This facilitates modeling of the expected areal anisotropy of the rock. The model domain has been sized to include a number of the water supply pumping wells lying to the north and northwest of the Site, as well as the Chemsol Site to the west, as illustrated in Figure 10. The model grid consists of 118 rows, 125 columns, and consists of four layers extending to a depth of 700 feet below mean sea level. This was done to permit modeling of the deep water supply wells. In total,

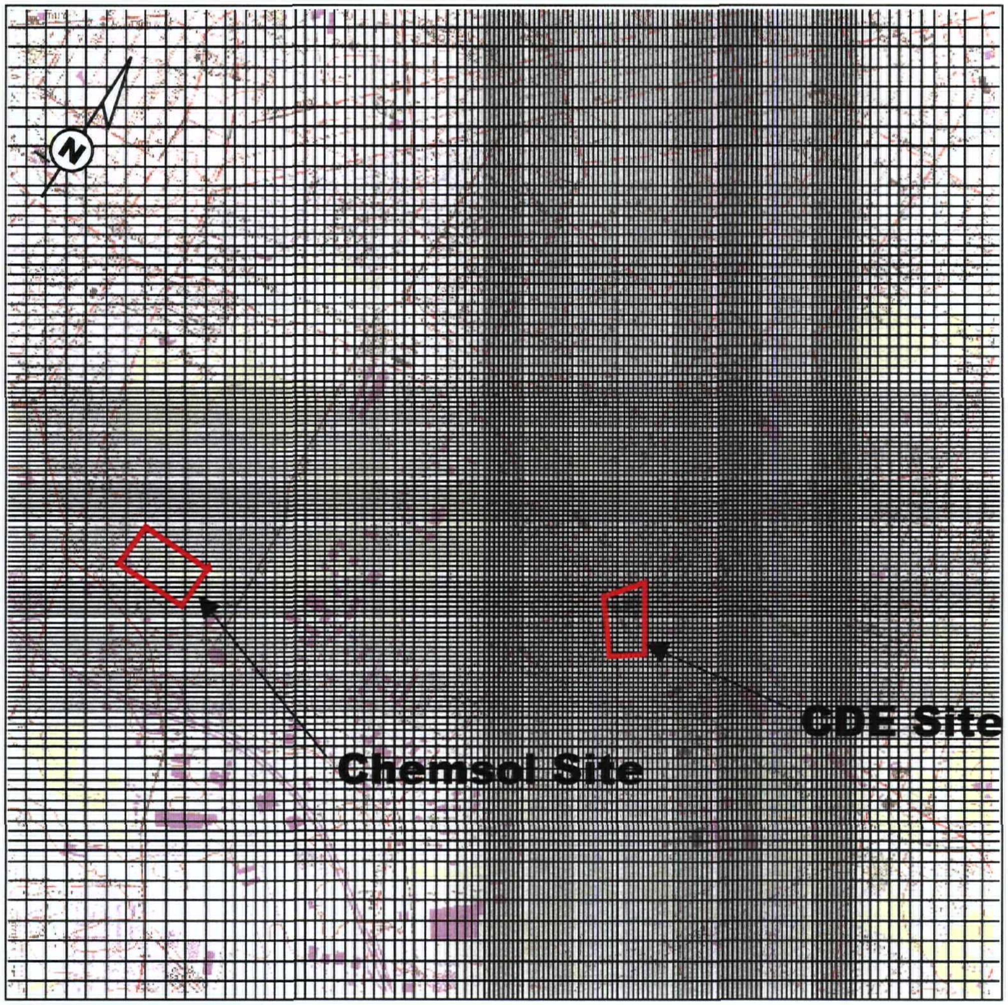


Approximate Scale: 1 in = 7200 ft

Figure 9
Groundwater Flow Model
Domain

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey



Approximate Scale: 1 in = 4000 ft

118 Rows

125 Columns

4 Layers

59,000 Cells

Figure 10
Groundwater Flow Model
Finite-Difference Grid

HydroQual

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

the model consists of 59,000 cells. Significant rivers and lakes such as the Bound Brook and Spring Lake were incorporated into the model. Recharge to the fractured rock aquifer was set up uniformly as 5 inches per year, which represents recharge from the surficial overburden to the underlying fractured rock. The fractured rock is preliminarily modeled as an "equivalent porous medium". At the scale of the preliminary modeling, this is considered a reasonable approximation. Moreover, the Passaic formation has been successfully modeled as an equivalent porous medium with vertical and areal anisotropies to represent the fracture and/or bedding plane controlled flow system. As further field data are generated, the validity of this assumption will be continuously re-evaluated.

The model was calibrated using the average of the two rounds of groundwater levels taken at the Site in October 2000 and a non-pumping set of water levels taken on October 12, 2000 at the Chemsol Superfund Site. Notwithstanding its preliminary nature, the model matches water levels on the two sites to quite close tolerances. The absolute residual mean differential between observed and simulated water levels in monitoring wells on the two sites is less than 0.40 feet. Groundwater flow directions are also similar to those observed on each site.

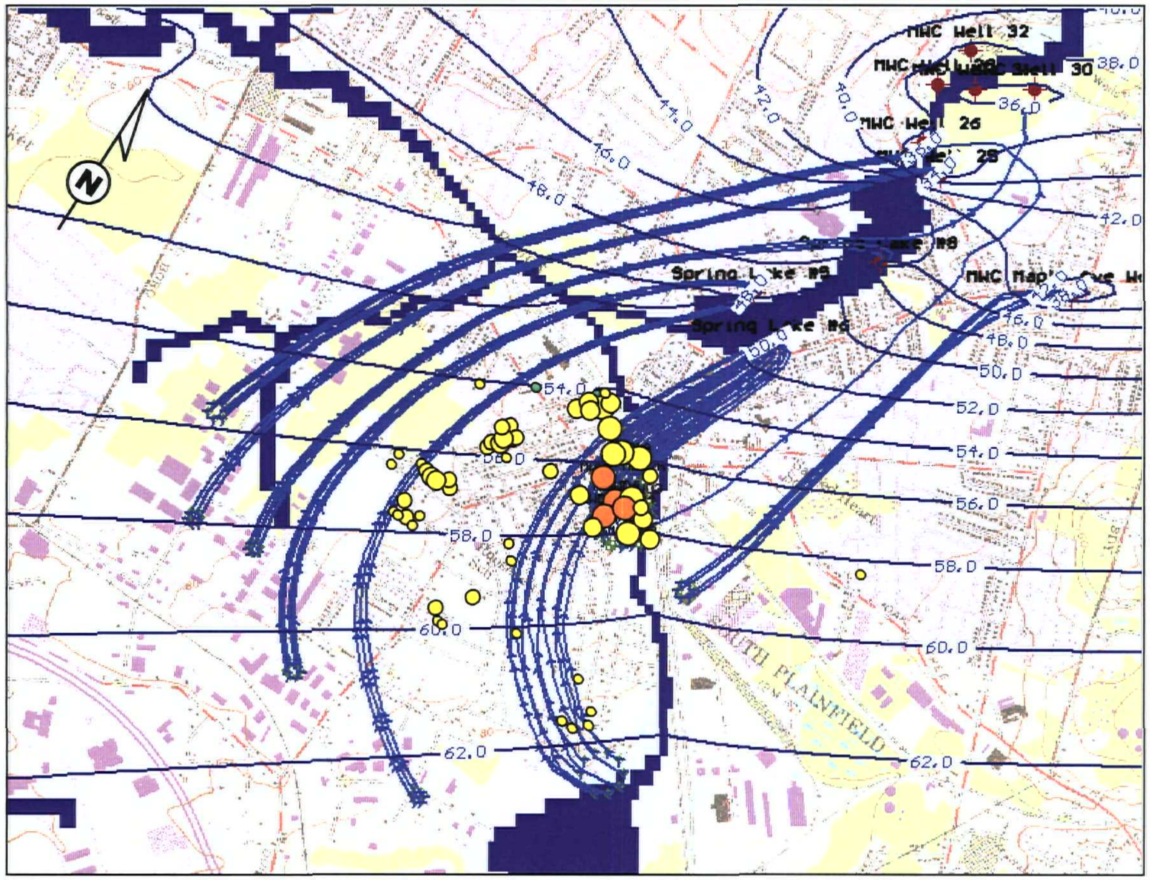
The following observations and insights have been gained through this preliminary modeling exercise:

- The hydrogeologic regime in the area of the Site is strongly influenced by the array of major water supply wells lying generally north of the Site. Modeling indicates that any significant variations in pumping rates of these wells, particularly those closer to the Site, produce major alterations in groundwater flow patterns in the rock aquifer beneath and around the Site. For example, Figure 11 shows projected groundwater flow paths from the Site, as well as a number of random flow paths from the surrounding area. In this simulation, the water supply wells are pumping at their reported yields and the areal anisotropy of the aquifer is set to nine. As previously noted, the Passaic Formation exhibits a higher hydraulic conductivity parallel to the strike of the bedding planes. An areal anisotropy of nine indicates that the hydraulic conductivity is nine times higher along strike than perpendicular to strike, as noted on Figure 11. The figure illustrates that groundwater originating from areas that lie well to the south and west of the Site flow past the Site through areas noted as having TCE in groundwater, as indicated by the bubble plots of TCE concentrations superimposed on Figure 11. As a point of reference, note that in this simulation, the flow lines originating from the lower central portion of the figure actually flow beneath the Site.

- Contrast this simulation with the simulation presented in Figure 12. In this simulation, the pumping rate of the two Spring Lake water supply wells closest to the Site (Spring Lake Wells No. 5 and No. 6) have been reduced to one-half of their reported yields. The effect on the groundwater flow system is dramatic. Flow lines are diverted in a much more westerly trajectory. As a point of reference, flow lines originating in the lower central portion of the figure now flow well to the west of the Site through a number of areas of known TCE contamination before ultimately reaching the water supply wells. The sensitivity of the flow system to changes in well pumping is further illustrated in Figure 13. In this case, the two Spring Lake wells closest to the Site (Spring Lake Wells No. 5 and No. 6) are shut down altogether. The effect on the flow system is again quite significant. Flow lines from potential off-site sources are diverted well west of the Site.

- In addition to illustrating the dynamic nature of the groundwater flow system in this area and the importance of the nearby water supply wells, the modeling also indicates that there could be other sources contributing to the observed TCE contamination in the vicinity of the Site, which sources are associated with a number of facilities lying to the south and west of the Site itself. Further research is needed to ascertain whether these facilities represent significant contributors to the observed groundwater impacts.

- The preliminary groundwater flow modeling also underscores the importance of defining the hydraulic conductivity parameters of the aquifer, most notably, the aquifer's areal anisotropy. Anisotropy in the Passaic Formation has been observed to range from as low as one (isotropic) to more common values ranging from five to ten, but also to as high as 22. The model was calibrated with an areal anisotropy of nine oriented parallel to strike. An anisotropy of this magnitude is quite common in the Passaic Formation and was suggested by the calibration efforts. However, to illustrate the importance of areal anisotropy in controlling groundwater flow directions, consider the flow paths presented in Figures 14 and 15. In Figure 14, the areal anisotropy has been reduced to six while the water supply wells have been reset to the baseline condition of pumpage at their reported yield. As can be seen in Figure 14, flow lines with an areal anisotropy of six, flow more easterly toward the water supply wells. As a point of reference, the flow lines originating from the lower central portion of the figure now flow to the east of the Site. Adjusting the areal anisotropy to 3, as illustrated in Figure 15, only accentuates this more easterly flow pattern. As noted on Figure 15, flow lines originating from the lower central portion of the figure now flow well east of the Site.



Approximate Scale: 1 in = 3900 ft

Legend

54.0 Potentiometric Contours

Flow Paths

River Cells

Figure 11
Flow Paths from Surrounding Sites with Water Supply Wells Pumping at their Yields and Areal Anisotrophy = 9

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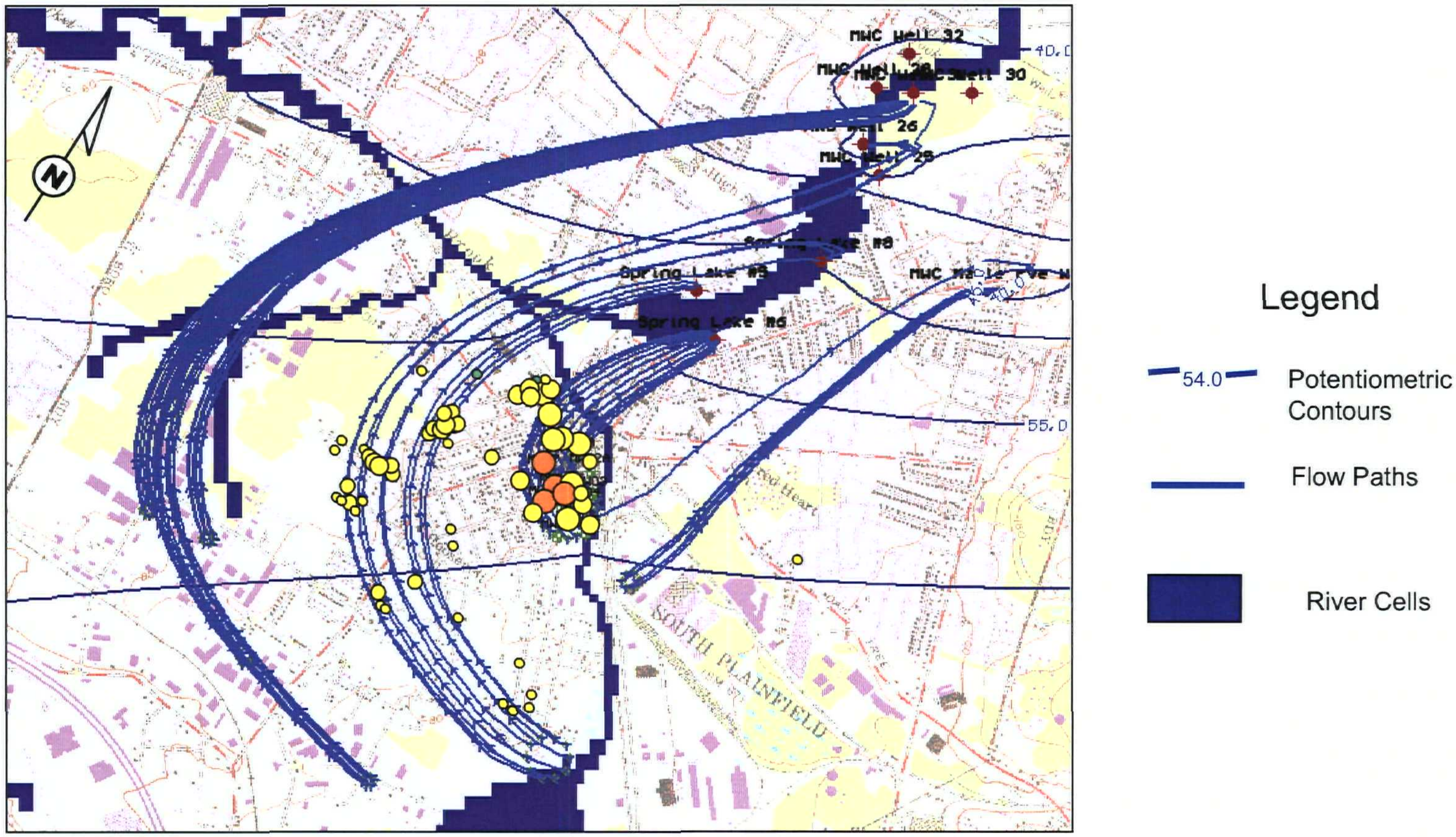
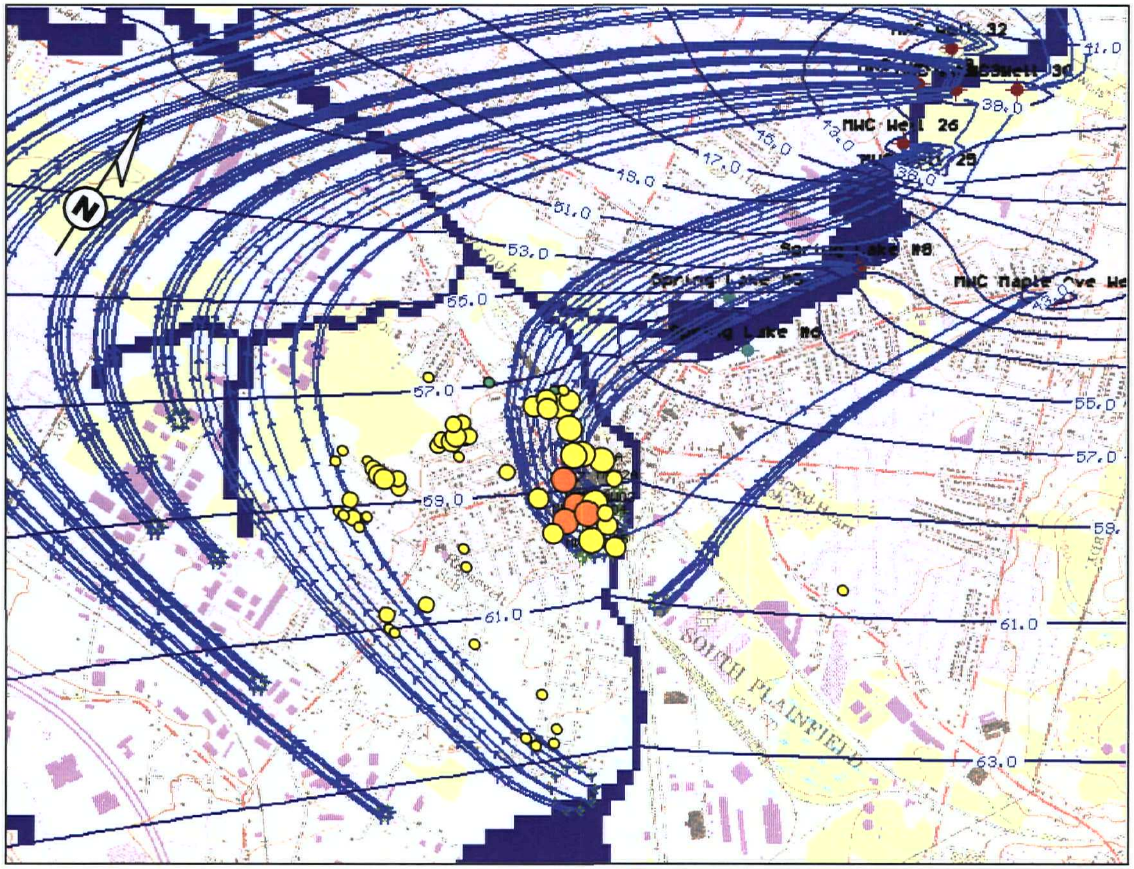


Approximate Scale: 1 in = 3900 ft

Figure 12
Flow Paths from Surrounding Sites with Two Closest Spring Lake Water Supply Wells Pumping at 1/2 Their Yields and Areal Anisotrophy = 9

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey



Approximate Scale: 1 in = 3900 ft

Legend

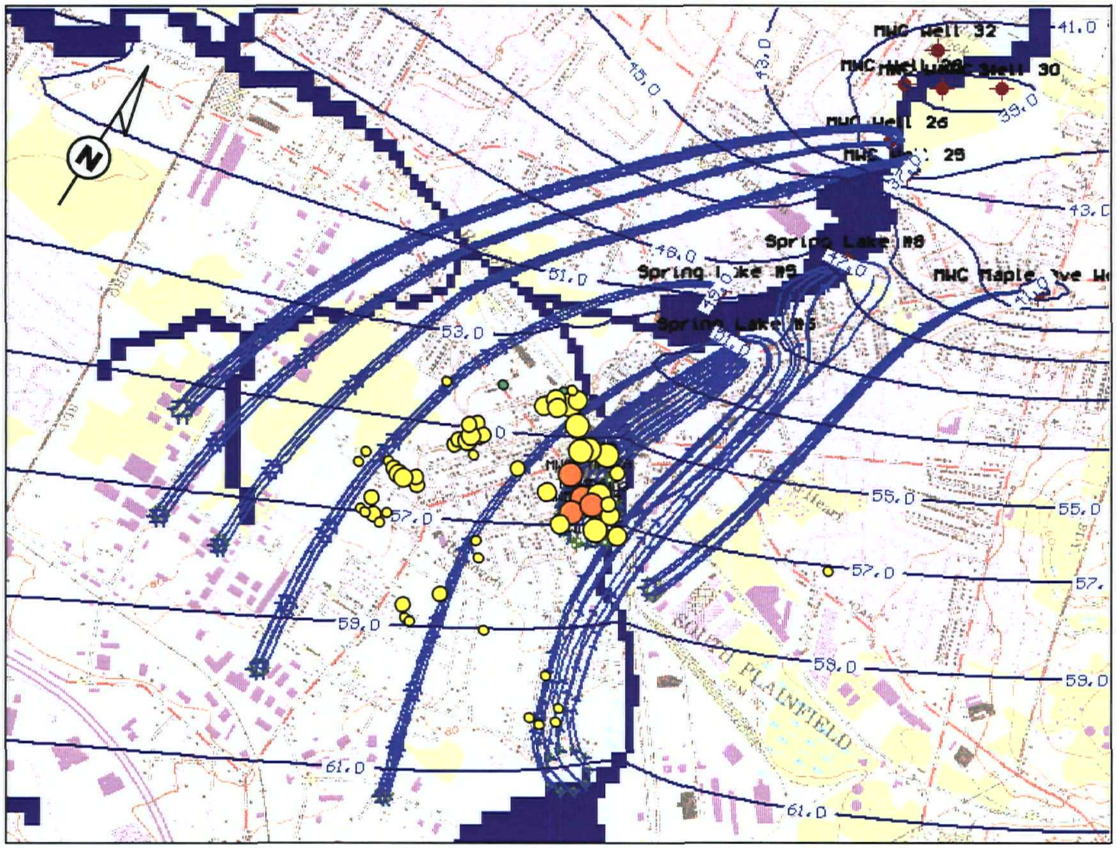
54.0 Potentiometric Contours

Flow Paths

River Cells

Figure 13
Flow Paths from Surrounding Sites with Two Closest Spring Lake Water Supply Wells Shut Down and Areal Anisotrophy = 9

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey



Approximate Scale: 1 in = 3900 ft

Legend

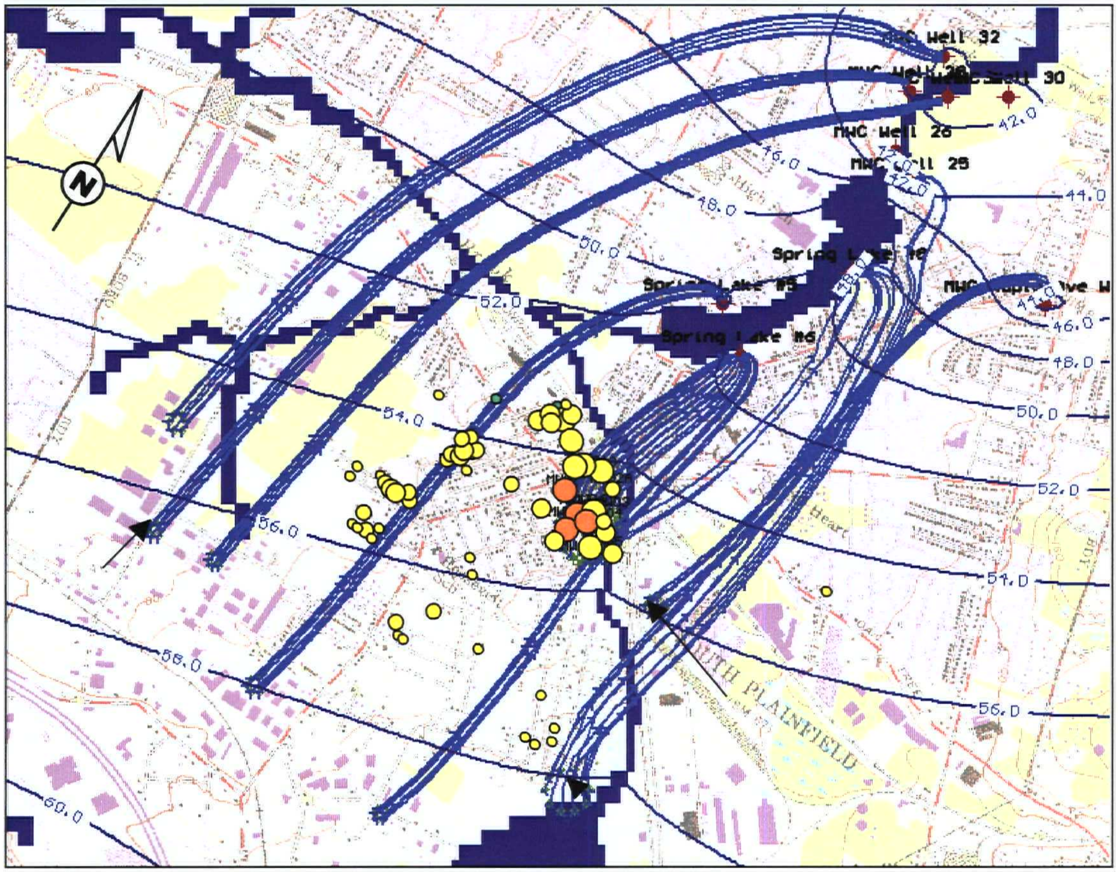
54.0 Potentiometric Contours

Flow Paths

River Cells

Figure 14
Flow Paths from Surrounding Sites with Water Supply Wells Pumping at Their Yields and Areal Anisotrophy = 6

Cornell-Dubilier Electronics
Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey



Approximate Scale: 1 in = 3900 ft

Legend

54.0 Potentiometric Contours

Flow Paths

River Cells

Figure 15
Flow Paths from Surrounding Sites with Water Supply Wells Pumping at Their Yields and Areal Anisotrophy = 3

HydroQual

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Superfund Site
Operable Unit No. 3
South Plainfield, New Jersey

In summary, completion of the preliminary groundwater flow modeling has provided a number of useful insights into the nature of this hydrogeologic system and identified key data needs as summarized below:

1. Groundwater flow patterns in the Passaic Formation aquifer are likely strongly controlled and influenced by the pumping of nearby water supply wells, most notably those at Spring Lake. However, before conclusions are drawn, the use, pumping duration, and pumping rates of these wells must be confirmed.

2. The areal anisotropy of the Passaic Formation aquifer is a critical parameter in understanding groundwater flow patterns in the rock. In particular, an understanding of areal anisotropy is paramount to discerning potential source areas for contamination.

The preliminary groundwater flow model will be updated as new information is obtained during the Remedial Investigation and will continue to be used as a tool, as applicable, in developing a quantitative understanding of the hydrogeologic system and assessing which hydrogeologic factors govern its behavior. As previously noted, a well records search is underway, water allocation permit records have been obtained from the NJDEP, and in December 2006 a request was made to Middlesex Water Company for clarification of information obtained to date. The location and rates of groundwater withdrawal will be input to the model, along with hydrogeologic parameters obtained during the Remedial Investigation, to further enhance the understanding of groundwater flow patterns.

SECTION 7

DATA NEEDS

On the basis of the current CSM and understanding of the Site hydrogeology and contaminant distribution, the following specific data needs have been identified as key aspects of the upcoming Remedial Investigation.

- Assessment of the current and historical groundwater use in the vicinity of the Site. This work is currently underway and the Middlesex Water Company and NJDEP have been contacted with requests for information.

- Assessment of the anisotropy of the Passaic Formation in the vicinity of the CDE Site and its impact on groundwater flow direction.

- Assessment of the hydrogeologic parameters of transmissivity, storativity, hydraulic gradients and fracture orientation.

- Identification of the current and historical (if different) groundwater flow direction.

- Assessment of vertical hydraulic gradients and the presence/absence of aquitards.

- Assessment of the vertical and horizontal distribution of contaminants of concern.

- Assessment of the pore water concentration of VOCs in the rock matrix and the potential implications of matrix diffusion as it relates to remedial alternatives.

- Assessment of the potential for vapor intrusion into businesses and homes overlying the dissolved groundwater plume.

The data needs noted above will be considered in the planning phases of the work to be performed for the Remedial Investigation, consistent with the requirements of the Settlement Agreement.

SECTION 8

REFERENCES

United State Environmental Protection Agency (USEPA), Record of Decision - Operable Unit Two, Cornell-Dubilier Electronics, Inc. Superfund Site South Plainfield, Middlesex County, New Jersey, September 2004.

Groundwater Technology Inc. – Results of Public Records Review, Hamilton Industrial Park Area, South Plainfield, New Jersey, April 1994.

Foster Wheeler Environmental Corporation – Remedial Investigation Report for Operable Unit 2, Cornell-Dubilier Electronics, Inc. Superfund Site, South Plainfield, Middlesex County, New Jersey, August 2001.

ATTACHMENT D

DECEMBER 21, 2005 LETTER TO MIDDLESEX WATER COMPANY

Attachment D
To Work Plan

HydroQual

Environmental Engineers & Scientists

December 21, 2005

Mr. David Brogle
Middlesex Water Company
1500 Ronson Road
Iselin, New Jersey 08830

DANA.001.001.01.0C

Re: Cornell-Dubilier Superfund Site
OU-3 RI/FS
Well Inventory

Dear Mr. Brogle:

As you had suggested during the meeting with the US Environmental Protection Agency (USEPA) on October 18, 2005, regarding our efforts to compile information on location and pumping rates of Middlesex Water Company water supply wells, HydroQual, Inc. has employed all of the resources at our disposal for collecting available information. To date we have obtained available information from the New Jersey Department of Environmental Protection (NJDEP), Bureau of Water Allocation, on your water allocation permits since 1936. In addition, we have obtained available records from the NJDEP on both existing and previously abandoned wells, both public water supply and other types of wells (e.g., private water supply, monitoring). Finally, we have also contacted the Middlesex County Public Health Department, the Middlesex County Engineering Department, the Borough of South Plainfield Public Works Department, and the Plainfield Public Works Department, none of which keep records on wells.

As a result of our efforts we have obtained a substantial volume of useful information, which we believe will be beneficial in understanding both current and historical groundwater flow patterns. Nonetheless, there are lingering inconsistencies and gaps in the data, which may affect our ability to interpret groundwater flow conditions, and we would appreciate your assistance with reconciling these inconsistencies and filling these gaps, if at all possible, since we have not been able to do so through all of the other resources at our disposal. More specifically, we would appreciate your assistance with the following:

1. At our October 18 meeting, you had indicated that Middlesex Water abandoned a group of wells in the 1960s. We have been unable to document this occurrence and, therefore, are concerned that we may be missing records on a group of wells. Would you be able to provide any information on these wells or clarify the timing or occurrence of this well abandonment?

2. We have records for eight Middlesex Water Company wells that were abandoned in 1991, with the following permit numbers (we do not have well names):

   2540339, 2540340, 2540341, 2540342, 2540343, 2540344, 2540345, 2540346

   However, the water allocation permit records do not indicate the cessation of pumping from wells during this time period. Do you have any records for these wells that would help clarify this situation?

3. From 1936 to 1983, the water allocation permit records use well names. In 1984 and 1985, the water allocation permit records change to three and four digit well permit numbers. Then from 1985 to the present, the water allocation permit records change to a typically five to seven digit permit number and are reasonably correlated to names. However, we have been unable to correlate all of the records among the various naming conventions, and to confirm that the well locations are identical for a given naming convention. For example, the Park Avenue Station has records back to 1953, but we do not have the ability to confirm the number and location of wells with the 1986 data, if indeed they are the same wells. We are hoping that you may have a summary of well information that would permit us to correlate names, well numbers, and permit numbers. We have attached a list of well names and permit numbers that are used in the water allocation permit records, to the extent this may help you in assisting us.

4. Finally we do not have location information on all of the wells. We have coordinates that would allow us to locate wells only for the Maple Ave., Spring Lake (Nos. 5, 6, 8 and 9) and portion of the Park Ave. (Nos. 25-29, 31, and 32) wells. If you had well coordinates or a well location map, it would be most helpful.

We appreciate the assistance you have provided to date in directing us to useful sources of information. We would also appreciate any assistance that you can provide in resolving the issues that we have identified in this letter.

Thank you and please contact us should you have questions or require additional information that would be of assistance to you.

Very truly yours,

HYDROQUAL, INC.

Gary J. DiPippo

Gary J. DiPippo, P.E.
Manager of Hydrogeology and
Remediation Services

DANA.001.001.01.0C\BROGLE_23DEC05_LTR

cc: M. Last, Esq.
W. Lee
B. Thompson

SUMMARY OF WATER ALLOCATION PERMIT RECORDS
WELL NAMES AND PERMIT NUMBERS
AS OF DECEMBER 2005

Well Names:

Park Ave. Station
So. Plainfield Station
Tingley Lane Station
Tingley Lane No. Station
Tingley Lane So. Station
Sprague Ave. Station
Maple Ave. Station
Maplewood Ave. Station
Spring Lake Station
Thermal Well

1984-1985 Permit Numbers:

784
913
1111
1112
1210
1327

Current Permit Numbers (with names):

Tingley Lane North:
- Tingley La.#1: 25-408
- Tingley La.#2: 25-3970
- Tingley La.#3: 25-2008
- Tingley La.#4: 25-2009

Tingley Lane South:
- Tingley La.#5: 25-4516
- Tingley La.#6: 25-4517
- Tingley La.#7: 25-5432
- Tingley La.#8: 25-5637
- Tingley La.#9: 25-5965

Thermal Well: 25-13518

Maple Ave 1: WSWL 64907-2500010001

Sprague Ave 1: WSWL 64901-2500009603

Sprague Ave 2: WSWL 64924-2500011464

Spring Lk 5: WSWL 64939-2500011823
Spring Lk 6: WSWL 64940-2500011828
Spring Lk 8: WSWL 64955-2500012364
Spring Lk 9: WSWL 64956-2500012365

Park Ave 18: WSWL 69979-4500000274
Park Ave 19: WSWL 69980-4500000275
Park Ave 20: WSWL 69981-4500000276
Park Ave 21: WSWL 69982-4500000277
Park Ave 22: WSWL 69983-4500000278
Park Ave 23: WSWL 64905-2500009763
Park Ave 24: WSWL 69984-4500000279
Park Ave 25: WSWL 64935-2500011815
Park Ave 26: WSWL 64936-2500011816
Park Ave 27: WSWL 64938-2500011822
Park Ave 28: WSWL 64947-2500012119
Park Ave 29: WSWL 64948-2500012120
Park Ave 30: WSWL 64949-2500012130
Park Ave 31: WSWL 64958-2500012461
Park Ave 32: WSWL 64950-2500012131